May-June 1981
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Number 3

Mariners Weather Log

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Malcolm Baldrige, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
James P. Walsh, Acting Administrator
ENVIRONMENTAL DATA AND INFORMATION SERVICE.
Thomas D. Potter, Director

Front cover: The 5,881-ton HELLENIC CARRIER is sailing toward Norfolk, still in fog, with a large hole in her side after a collision with the 26,406-ton LASH ATLANTICO in fog while about 25 mi southeast of Cape Henry. There were no injuries reported. The Captain, Chief Engineer, and Radio Officer remained aboard. Twenty-five other crewmen abandoned ship and were picked up by the EASTERN SAGA. U.S. Coast Guard Photo.

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The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through June 30, 1983.

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Editorial Assistant: Annette Farrall

May-June 1981
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Washington, D.C.

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Mariners Weather Log

EASTERN NORTH PACIFIC TROPICAL CYCLONES, 1980

Emil B. Gunther
Eastern Pacific Hurricane Center
National Weather Service, NOAA
Redwood City, Calif.

The 1980 eastern North Pacific tropical cyclone season began June 9 and ended October 29. Spanning 143 days, the season was 29 days shorter than the 1979 season. There were 15 cyclones during the season, two more than in 1979. Seven of the 15 cyclones became hurricanes, seven were tropical storms, and one was a tropical depression. Hurricane hours during the 1980 season totaled 586 compared to 326 in 1979. Tropical storm hours totaled 476 compared to 482 in 1979. The highest sustained windspeed during the 1980 season was 120 kn, attained by hurricane Kay on September 18. Only three sevenths of the 1980 hurricanes had windspeeds equal to or in excess of 100 kn compared to two-thirds of the 1979 hurricanes. Table 1 shows the monthly distribution of 1980 tropical cyclone activity. Tables 2 and 3 compare this activity with that of recent years. The 1966-80 period was chosen for comparison since it probably includes all tropical cyclone activity due to satellite coverage. Prior to 1966 some activity was undetected because of the sparsity of data. A summary of important features of the 1980 season is given in table 4. Cyclone tracks are shown in figures 1 and 2.

Eastern Pacific Hurricane Center forecasters issued 270 tropical cyclone advisories during the 1980 season compared to 198 in 1979. Advisories were issued four times daily on a regularly scheduled basis.

The 1980 season was relatively uneventful in that none of the tropical cyclones moved onshore, and no reports of damage or casualties were received from ships at sea. Seventy miles was the nearest any storm approached land, when tropical storm Newton dissipated west of Puerto Vallarta on the central Mexican coast.

The National Satellite Service Field Station, collocated with the Eastern Pacific Hurricane Center (EPHC), provided excellent satellite coverage. Several movie loops were available each day as well as visual and infrared data from the stationary GOES and the polar-orbiting NOAA satellites. Enhanced H-curve infrared imagery was especially useful in depicting high-level cold-core centers. Cyclonic intensity was calculated using the Dvorak technique of satellite analysis.

No reconnaissance flights were made into eastern North Pacific tropical cyclone activity during the 1980

Table 1.--Monthly distribution of eastern North Pacific tropical cyclones, 1980*

	May	June	July	Aug.	Sept.	Oct.	Nov.	Total
Tropical depressions	0	1	0	0	0	0	0	1
Tropical storms	0	1	3	0	1	2	0	7
Hurricanes	0	2	2	2	1	0	0	7
Total	0	4	5	2	2	2	0	15

*Cyclones are ascribed to the month in which they began.

Table 2.--Frequency of eastern North Pacific tropical storms and hurricanes combined by months and years*

Year	May	June	July	Aug.	Sept.	Oct.	Nov.	Total
1966	0	1	0	4	6	2	0	13
1967	0	3	4	4	3	3	0	17
1968	0	1	4	8	3	3	0	19
1969	0	0	3	2	4	1	0	10
1970	1	3	6	4	1	2	1	18
1971	1	1	7	4	2	2	1	18
1972	1	0	1	6	2	1	1	12
1973	0	3	4	1	3	1	0	12
1974	1	3	3	6	2	2	0	17
1975	0	2	4	5	3	1	1	16
1976	0	2	4	4	3	1	0	14
1977	1	1	1	1	3	1	0	8
1978	1	3	4	6	2	2	0	18
1979	0	2	2	2	1	2	1	10
1980	0	3	5	2	2	2	0	14
Total	6	28	52	60	40	26	5	216
Average	0.4	1.9	3.5	3.9	2.7	1.7	0.3	14.4

*Cyclones are ascribed to the month in which they began.

Table 3.--Number of eastern North Pacific tropical storms reaching hurricane intensity by months and years*

Year	May	June	July	Aug.	Sept.	Oct.	Nov.	Total
1966	0	1	0	4	2	0	0	7
1967	0	1	0	2	1	2	0	6
1968	0	0	0	3	2	1	0	6
1969	0	0	1	1	1	1	0	4
1970	1	0	1	1	0	1	0	4
1971	1	1	5	2	2	1	0	12
1972	1	0	0	6	1	0	0	8
1973	0	1	3	0	2	1	0	7
1974	0	2	2	4	2	1	0	11
1975	0	1	2	3	1	1	0	8
1976	0	2	1	2	3	0	0	8
1977	0	0	1	1	1	1	0	4
1978	1	2	3	4	1	1	0	12
1979	0	1	1	2	1	1	0	6
1980	0	2	2	2	1	0	0	7
Total	4	14	22	37	21	12	0	110
Average	0.3	0.9	1.5	2.5	1.4	0.8	0.0	7.3

*Cyclones are ascribed to the month in which they began.

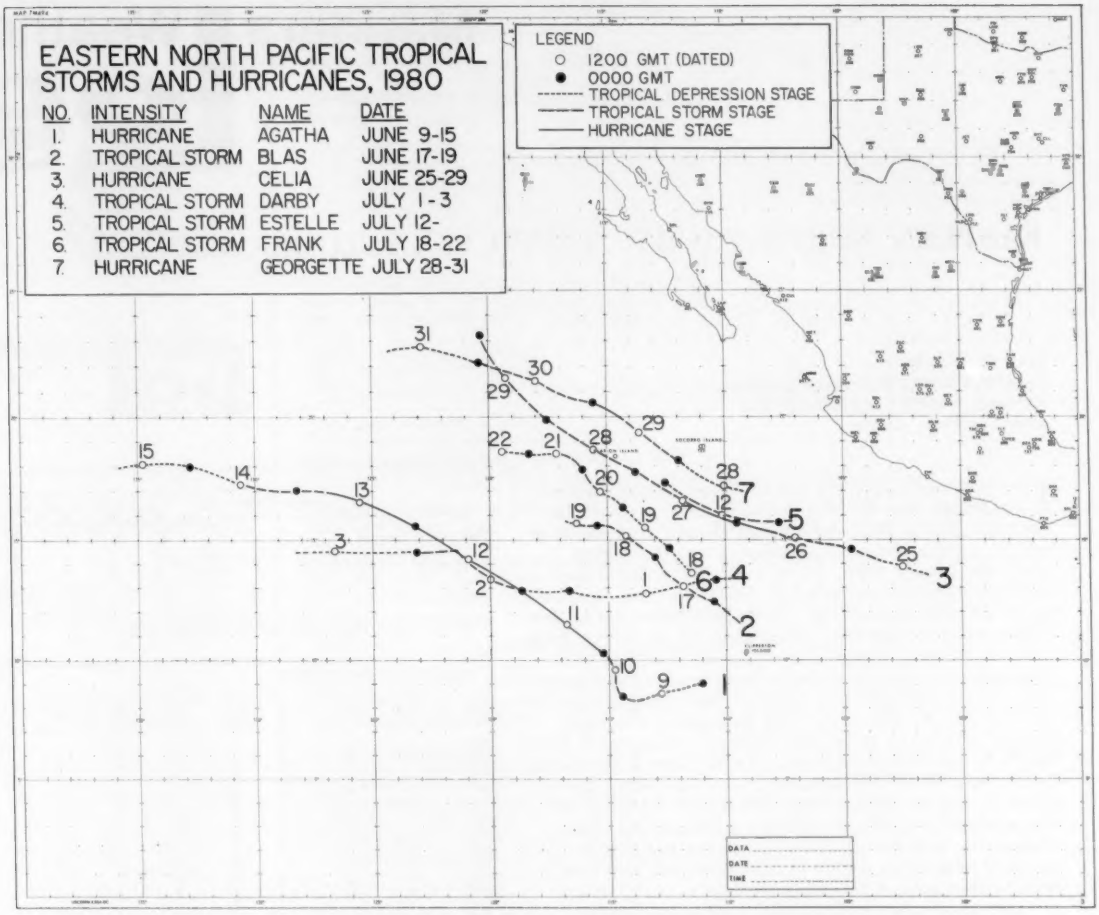

Figure 1.--Tracks of eastern North Pacific tropical cyclones, June 9 - July 31, 1980.

season. However, U.S. Air Force aircraft were placed on standby status during hurricane Howard, when the cyclone threatened the west coasts of Baja and southern California.

Although satellite imagery continues to improve and is an important tool used by tropical forecasters, aircraft reconnaissance and synoptic ship reports retain their importance as invaluable in situ observations.

Several numerical forecasts for tropical cyclone tracks for the eastern North Pacific were available from the National Hurricane Center in Miami. The forecast tracks included an analog model (EPANALOG), a statistical synoptic model (EPHC77), and a simulated analog model (CLIPER). The barotropic model (SANBAR) was not available. The movable fine-mesh model from the National Meteorological Center in Maryland was not run. Table 5 shows the average forecast errors. While the numerical forecasts are independent of each other, the forecasts made by the EPHC forecasters are not independent of the numerical forecasts.

Only named tropical cyclones are described in the following paragraphs. The continuation of hurricane Kay is described in the article on central North Pacific tropical cyclones beginning on page 161.)

HURRICANE AGATHA - JUNE 9-15

The 1980 eastern North Pacific tropical cyclone season began with a small disturbance 400 mi south-southwest of Acapulco, Mexico, at 1800 on June 7. Moving west the disturbance began to intensify over 85°F water. Cyclonic circulation began to appear about the center by the 9th and the disturbance was upgraded to a tropical depression near 8.9°N, 111°W, about 130 mi southwest of Clipperton Island. The cyclone continued westward. By 1800 winds near the center had increased to 45 kn and the depression was upgraded to tropical storm Agatha near 8.3°N, 113.7°W. Observations from the ships NOVOWLYANOVSK and BABAEYEVSK, 130 mi east-southeast and north of Agatha, respectively, were helpful in locating the cyclone near 9.5°N, 114.8°W, at 1200 June 10. Winds near the center had increased to 70 kn by 1800, and Agatha was up-

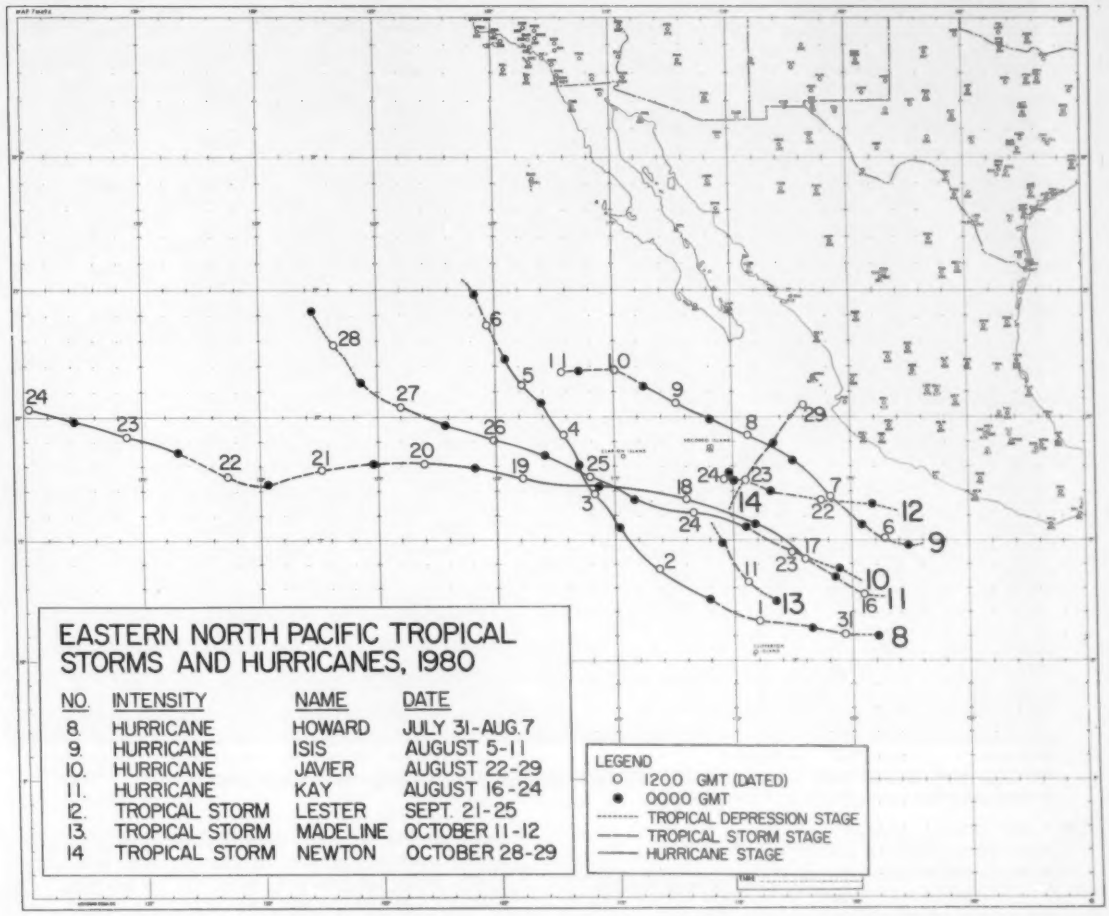
EASTERN NORTH PACIFIC TROPICAL STORMS AND HURRICANES, 1980
NO. INTENSITY NAME DATE
8. HURRICANE HOWARD JULY 31-AUG.7
9. HURRICANE ISIS AUGUST 5-11
10. HURRICANE JAVIER AUGUST 22-29
11. HURRICANE KAY AUGUST 16-24
12. TROPICAL STORM LESTER SEPT. 21-25
13. TROPICAL STORM MADELINE OCTOBER 11-12
14 TROPICAL STORM NEWTON OCTOBER 28-29
LEGEND
1200 GMT (DATED)
0000 GMT
TROPICAL DEPRESSION STAGE
TROPICAL STORM STAGE
HURRICANE STAGE

Figure 2.--Tracks of eastern North Pacific tropical cyclones, July 31 - October 29, 1980.

graded to a hurricane near 9.9°N, 114.9°W. The cyclone turned northwestward and reached its maximum intensity of 100 kn at 0000 on the 12th. Figure 3 shows Agatha at 2215 on June 11 just prior to reaching maximum intensity. The hurricane began to weaken with low clouds moving into the circulation from the west and north over 83°F water. By 1800 on the 13th winds near the center had diminished to 50 kn as the cyclone was downgraded to a tropical storm. Agatha turned westward and continued to weaken. She was downgraded to a tropical depression near 17.2°N, 130.7°W, at 1200 on the 14th. The final advisory was issued on the cyclone at 1800 on the 15th as the center dissipated near 17.9°N, 136°W.

TROPICAL STORM BLAS - JUNE 16-19

The second cyclone began as a disturbance 400 mi south-southwest of Acapulco at 0000 on June 15. Moving west-southwestward at 10 kn, the disturbance began to move around the southern side of an upper level high-pressure area over northern Mexico. It was 60 mi north of Clipperton Island on the 16th and began

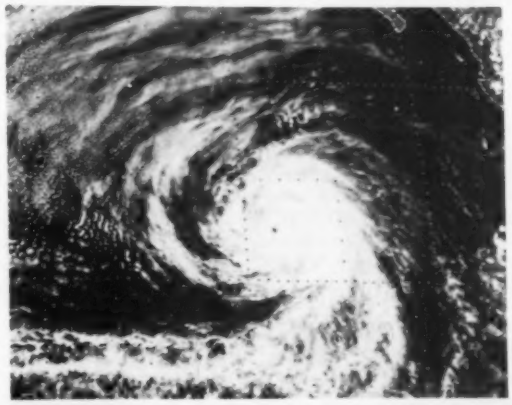

Figure 3.--Hurricane Agatha with winds near 100 kn at 2215 on June 11.

Table 4.--Eastern North Pacific tropical cyclones, 1980*

Cyclone lifespan	Depression	Storm	Hurricane	Storm	Depression	Final position	Highest sustained windspeed From	To	Kn
Hu Agatha	090000	091800	101800	131800	141200	151800	120000	120600	100
9-15 Jun	08.9-111.0	08.3-113.7	09.9-114.9	16.9-126.8	17.2-130.7	17.9-136.0	12.8-118.7	13.4-119.9	
Ts Blas		161800			191200	191800	170000	171800	50
16-19 Jun		11.8-109.9			15.6-116.3	15.7-116.7	12.3-110.5	13.5-112.5	
Td Three	170000					191200	170000	191200	30
17-19 Jun	14.6-102.5					20.1-108.0	14.6-102.5	20.1-108.0	
Hu Celia	250600	251800	261800	281800	290600	300000	261800	281800	65
25-30 Jun	13.5-101.4	14.2-103.6	15.3-108.3	19.2-116.6	20.5-118.3	23.1-120.3	15.3-108.3	19.2-116.6	
Ts Darby	010000	020600			030000	031800	021200	030000	45
1-3 Jul	13.2-110.4	12.8-118.4			14.4-123.1	14.4-128.4	13.3-120.0	14.4-123.1	
Ts Estelle		120000			121800	130000	120600	121200	40
12-13 Jul		15.6-107.7			16.5-111.3	17.2-112.5	15.7-108.8	15.9-110.1	
Ts Frank	180600	201200			211800	221200	201800	210000	45
18-22 Jul	13.1-111.0	16.9-115.2			18.4-117.6	18.5-119.5	17.3-115.7	17.8-116.0	
Hu Georgette	280600	290000	291600	300000	310000	311800	291600	300000	65
28-31 Jul	16.8-109.0	18.1-111.9	19.7-114.2	20.5-115.5	22.0-120.4	22.6-124.2	19.7-114.2	20.5-115.5	
Hu Howard	310000	311200	020000	060000	070600	070600	040600	041200	90
31 Jul-7 Aug	11.0-103.9	11.1-105.3	12.6-111.1	22.3-119.7	25.3-121.2	25.3-121.2	18.6-116.7	19.3-117.2	
Hu Isis	051800	060600	071200	100000	110600	111200	081800	090000	85
5-11 Aug	14.9-102.1	14.9-103.2	16.8-105.9	21.3-113.8	21.8-116.9	21.8-117.2	19.6-110.3	19.9-110.9	
Hu Javier	221800	231200	240000	270600	280000	290000	250000	251800	100
22-29 Aug	13.3-104.7	14.6-107.5	15.5-109.4	20.1-123.1	21.4-125.7	24.3-127.8	16.7-114.1	18.0-117.0	
Hu Kay	160600	161200	170600	201200					
16-24 Sep	12.7-103.8	12.8-104.6	13.9-106.4	18.1-123.0					
			230000			241200+	181800	190000	120
			18.5-133.5			20.3-139.8	17.0-113.9	17.2-115.7	
Ts Lester	211800	221800			241200	250000	221800	241200	35
21-25 Sep	16.2-103.1	16.8-107.4			17.5-110.4	17.5-110.0	16.8-107.4	17.5-110.4	
Ts Madeline	110000	110600			120000	120600	111200	120000	45
11-12 Oct	12.5-108.2	12.8-108.8			14.9-110.5	15.8-111.0	13.3-109.5	14.9-110.5	
Ts Newton	280300	280600			290600	291200	280600	290600	35
28-29 Oct	16.2-110.2	16.9-109.9			19.8-107.9	20.5-107.0	16.9-109.9	19.8-107.9	

*All times GMT, latitudes north, longitudes west. Hu = hurricane, TS = tropical storm, Td = tropical depression
+Passed to Central Pacific Hurricane Center (CPHC).

Table 5.--Forecast errors*

	Forecast period (hours)		
	24	48	72
EPHC forecasters	147/82	82/164	54/263
EPANALOG	135/80	93/147	58/237
EPHC77	125/89	84/167	53/279
CLIPER	140/112	99/168	63/273

*Number of cases/average error in nautical miles.

to intensify rapidly over 85°F water. By 1800 the disturbance was upgraded directly to tropical storm Blas near 11.8°N, 109.9°W. Blas turned northwestward and continued to intensify. The storm reached its maximum intensity of 50 kn by 0000 on the 17th, 145 mi north-northwest of Clipperton Island. As Blas continued to move northwestward, she weakened slowly over cooler 82°F water. By 1800 on the 18th winds near the center had diminished to 35 kn, 170 mi south of Clarion Island. By 1200 on the 19th with 30-kn winds, the storm was downgraded to a tropical depression near 15.6°N, 116.3°W.

HURRICANE CELIA - JUNE 25-30

Celia, the fourth cyclone of the season, began as a tropical disturbance 200 mi south of the Gulf of Tehuantepec on June 23. The disturbance began to intensify slowly over 85°F water. It was upgraded to tropical storm Celia near 14.2°N, 103.6°W, on the 25th. The ANCO ENDEAVOUR and EASTERN TREASURE, to the north of Celia, were helpful in analyzing the storm. Celia moved west-northwestward around the southern side of an upper level HIGH and intensified rapidly over 87°F water. By 1800 on the 26th winds near the center had increased to their maximum intensity of 65 kn, and the storm was upgraded to a hurricane near 15.3°N, 108.3°W. The Danish cargo ship DITTE SKOU, east-northeast of Celia, radioed helpful observations. Figure 4 shows Celia with 65-kn winds 85 mi southeast of

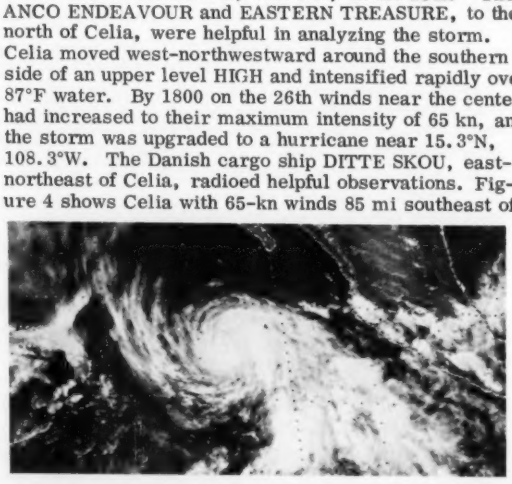

Figure 4.--Hurricane Celia with 65-kn winds 85 mi southeast of Clarion Island at 2215 on June 27.

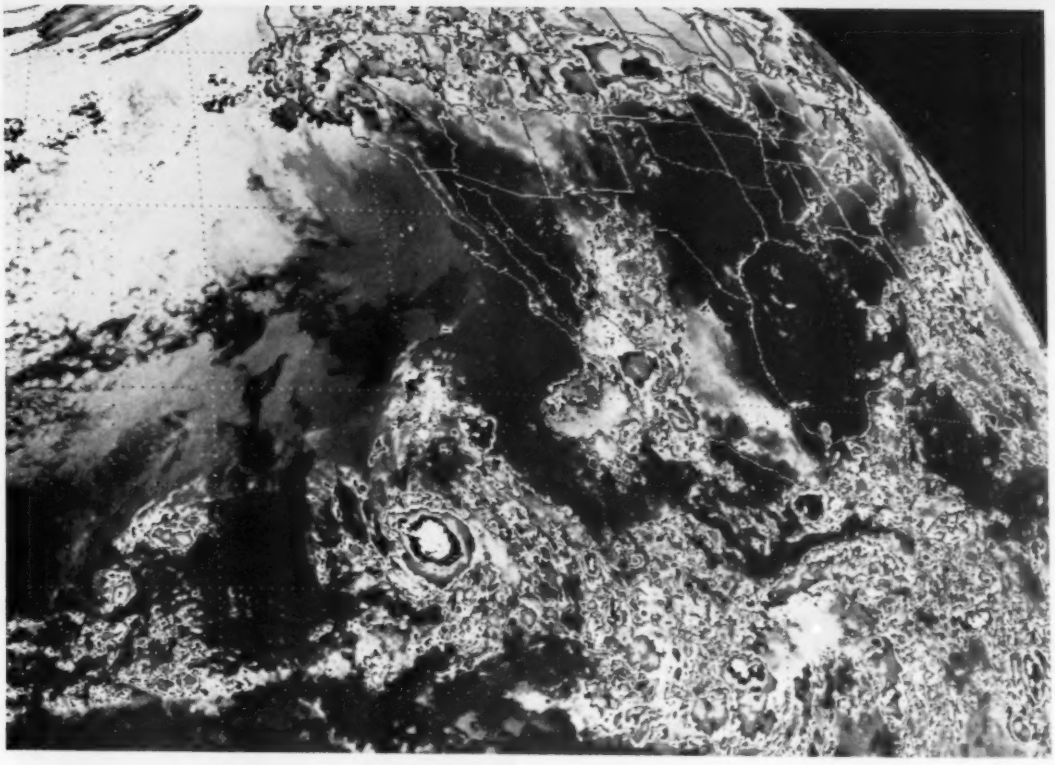

Figure 5.--Enhanced infrared satellite image showing tropical storm Darby near 13.3°N, 119.8°W, at 1115 on July 2.

Clarion Island at 2215 on the 27th. The cyclone passed 10 mi south of the Island at 0600 on the 28th, then began to weaken rapidly over cooler 77°F water. By 1800 the winds had decreased to 55 kn. By 0600 on the 29th winds had diminished to 30 kn and the cyclone was downgraded to a tropical depression. The depression moved northwestward, then turned north-northwest, dissipating near 23.1°N, 120.3°W, by the 30th. Although the depression dissipated 600 mi south of the California border, high-level clouds associated with the cyclone were carried northward and inland over the state.

TROPICAL STORM DARBY - JULY 1-3

As the final advisory was being issued on Celia, the next cyclone of the season was beginning to develop 500 mi west-southwest of Acapulco. Moving at 15 kn to the west-northwest, the disturbance was upgraded to a tropical depression on July 1. Turning westward the depression began to intensify over 85°F water. On the 2d the winds had increased to 35 kn, and the cyclone was upgraded to tropical storm Darby near 12.8°N, 118.4°W. Six hours later his winds near the center had reached their maximum intensity of 45 kn. Figure 5, an enhanced infrared satellite image, shows the cyclone at 1115 July 2 moving westward at 18 kn. Darby began to weaken rapidly over 78°F water. By the 3d winds near the center had diminished to 30 kn, and the storm was downgraded to a depression near 14.4°N, 123.1°W. With sea-surface temperatures dropping to 76°F and low clouds entering into the cyclonic circulation from the north, the depression weakened rapidly.

TROPICAL STORM ESTELLE - JULY 12-13

The sixth and shortest lived cyclone of the season lasted only 24 hr. It began as a disturbance 250 mi southwest of Acapulco at 0000 on July 11. The storm intensified rapidly and was upgraded directly to tropical storm Estelle near 15.6°N, 107.7°W, at 0000 on the 12th. Six hours later winds near the center had increased to their maximum intensity of 40 kn over 84°F water. The cyclone turned toward the west-northwest and began to weaken over 82°F water. The winds decreased to 25 kn by 1800, and the storm was downgraded to a depression. The final advisory was issued at 0000 on the 13th, 130 mi southwest of Socorro Island.

TROPICAL STORM FRANK - JULY 18-22

Four days after the final advisory on Estelle, the seventh cyclone of the season was discovered 175 mi northeast of Clipperton Island. It began to show cyclonic circulation after 24 hr and was upgraded to a depression on July 18 when 200 mi north-northwest of Clipperton Island. The cyclone then turned northwest and showed little intensification through the next 48

hr. The depression began to move over 82°F water early on the 20th and intensified. By 1200 winds had increased to 40 kn and the cyclone was named Frank near 16.9°N, 115.2°W. Frank reached maximum intensity of 45 kn near 17.3°N, 115.7°W, at 1800. As he traveled northwest he began to move over 78°F water and weaken. The storm turned westward, and by 1800 on the 21st winds had diminished to 30 kn. Frank was downgraded to a depression near 18.4°N, 117.6°W. With low clouds moving into the cyclonic circulation from the north and west, the depression weakened rapidly. The cyclone dissipated 275 mi west of Clarion Island.

HURRICANE GEORGETTE - JULY 28-31

Georgette had her debut 90 mi southwest of Acapulco on July 26. Moving west at 10 kn, the disturbance intensified over 87°F water. By the 28th cyclonic circulation could be seen and the disturbance was upgraded to a depression 160 mi southeast of Socorro Island. The cargo ship EISHO MARU, 160 mi south-southeast of the depression, contributed an important observation. Traveling west-northwestward the winds had increased to 35 kn by the 29th and the cyclone was upgraded to tropical storm Georgette, while 70 mi southwest of Socorro Island. At 1530 the CHRISTINA C, 70 mi east-northeast of Georgette, reported she was unable to maintain heading in 20- to 30-ft seas and winds over 60 kn. Sea-level pressure of 29.28 in (991.5 mb) was reported by the CHRISTINA C. Based on this report and later satellite information, Georgette was upgraded to a hurricane at 1600 on the 29th near 19.7°N, 114.2°W (fig. 6). Georgette continued west-northwestward over cooler 81°F water and weakened. Winds dropped to 55 kn by the 30th, and the cyclone was downgraded to a tropical storm. Winds near the center had diminished to 30 kn by the 31st. The cyclone weakened rapidly over 74°F water with colder low clouds moving into her circulation.

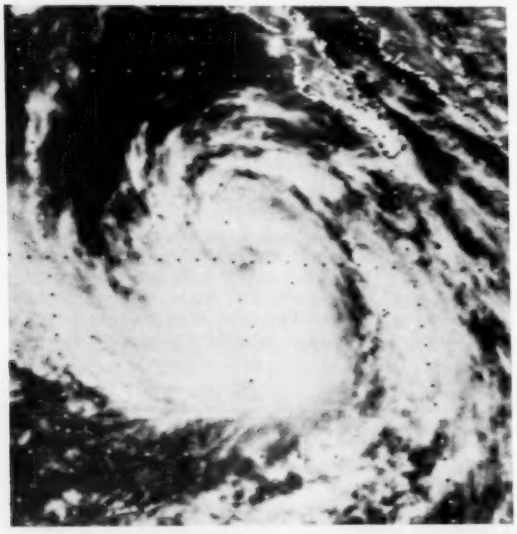

Figure 6.--Hurricane Georgette 95 mi north of Clarion Island at 1815 July 29.

HURRICANE HOWARD - JULY 31-AUGUST 7

As Georgette began to weaken from hurricane to tropical storm intensity, the next cyclone of the season was beginning to develop 300 mi south of Acapulco. The disturbance showed cyclonic circulation by July 31 and was upgraded to a tropical depression. The storm intensified over 86°F water. By 1200 the winds had increased to 40 kn and tropical storm Howard was named near 11.1°N, 105.3°W. He traveled west-northwestward and the winds had increased to 70 kn by 0000 on August 2 and was upgraded to a hurricane 180 mi northwest of Clipperton Island. Howard turned northwestward, moving around the southwest side of an upper level high-pressure area that was drifting westward from the central Mexican coast. His winds increased to their maximum intensity of 90 kn by 0600 on the 4th near 48.6°N, 116.7°W (fig. 7). Continuing on a northwestward track the cyclone weakened over cooler water. Low clouds to the west entered the circulation, further weakening the hurricane. By the 6th winds had diminished to 60 kn and Howard was downgraded to a tropical storm near 22.3°N, 119.7°W. Turning more northward, the storm weakened rapidly over progressively colder water. On the 7th winds had dropped to 25 kn, and the storm was downgraded to a depression.

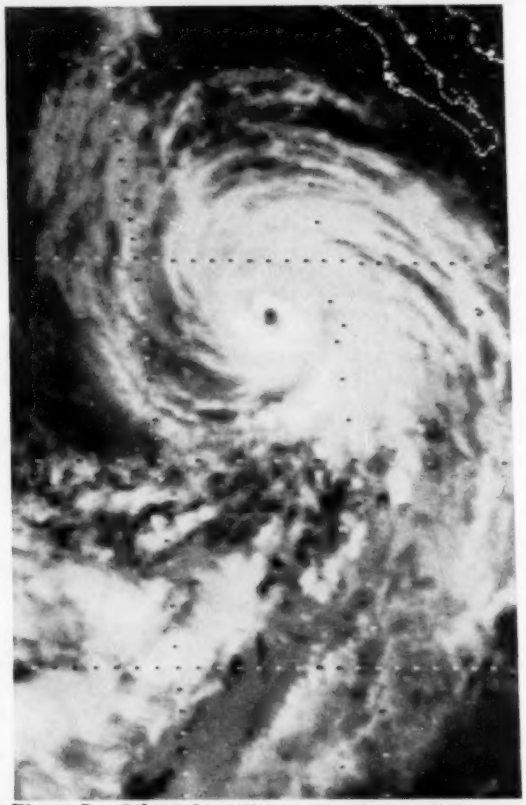

Figure 7.--Infrared satellite image showing hurricane Howard at maximum intensity of 90 kn near 18.6°N, 116.7°W, at 0615 on August 4.

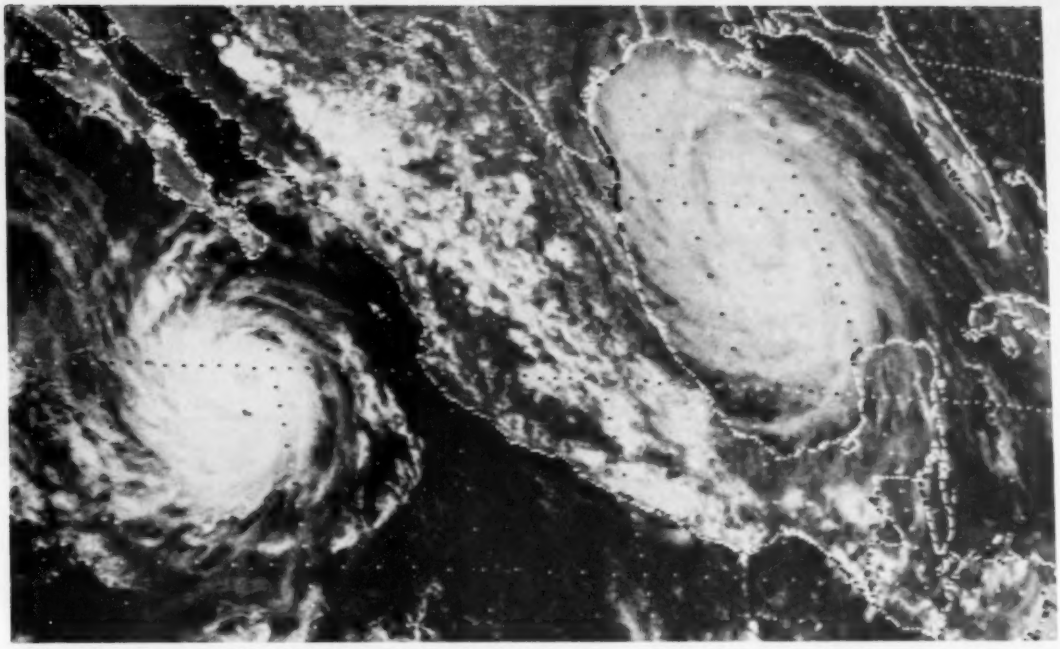

Figure 8.--Hurricane Isis at maximum intensity of 85 kn near 19.8°N, 110.7°W, at 2215 August 8. Hurricane Allen can be seen in the Gulf of Mexico.

HURRICANE ISIS - AUGUST 5-11

Isis developed 100 mi south of Acapulco on August 4. Drifting westward over 85°F water, the cyclone intensified. Winds had increased to 35 kn by 0600 on the 6th and the depression was upgraded to tropical storm Isis near 14.9°N, 103.2°W. The cyclone began to move around the southern side of an upper level HIGH centered near the tip of Baja California. Isis turned northwestward and, with the winds increasing to 65 kn, was upgraded to a hurricane 310 mi east-southeast of Socorro Island at 1200 on the 7th. Weather reports from the ANCO CHARGER, VERRAZANO, DELTA AFRICA, OGDEN FRAZER, YAWATA MARU, MONTPELR VICTORY, TOYOTA MARU No. 16, and ALASKA 1 helped locate Isis between 1800 on the 6th and 0000 on the 8th. By the 8th Isis was 190 mi east of Socorro Island. The cyclone now turned west-northwestward and continued intensification. The TOYOTA MARU No. 16 was 150 mi northeast of the center at 0600 with 58-kn east-southeasterly winds and 32-ft seas. By 1800 Isis had reached her maximum intensity of 85 kn while 55 mi northeast of Socorro Island. Winds on Socorro increased to 55 kn as Isis passed 50 mi to the north of the island (fig. 8). Observations from the CLOVER and CAUSEWAY were especially useful on the 9th. Isis continued on a west-northwestward track and weakened over cooler water as low clouds to the west entered the circulation. By the 10th the winds were down to 60 kn and the hurricane was downgraded to a tropical storm near 21.3°N, 113.8°W. Isis continued west-northwestward for another 12 hr, then turned westward and weakened rapidly. The HAGOROMO MARU and REYNOLDS were helpful in locating the center of the storm. On the 11th the winds dropped to 30 kn and Isis was downgraded to a depression near 21.8°N, 116.9°W.

HURRICANE JAVIER - AUGUST 22-29

A little over a week passed before the next tropical disturbance formed 350 mi south of the Gulf of Tehuantepec on August 19. Moving slowly to the west-northwest, the disturbance intensified to a depression and then to tropical storm Javier near 14.6°N, 107.5°W at 1200 on the 23d. The winds rapidly increased to 65 kn and Javier was upgraded to a hurricane near 15.5°N, 109.4°W, at 0000 on the 24th. The SMIT-ROTTERDAM, 110 mi to the east, felt the influence of the hurricane. Javier passed 160 mi south of Socorro Island at 0900. He reached maximum intensity of 100 kn at 0000 on the 25th about 200 mi southwest of Socorro (fig. 9). Javier

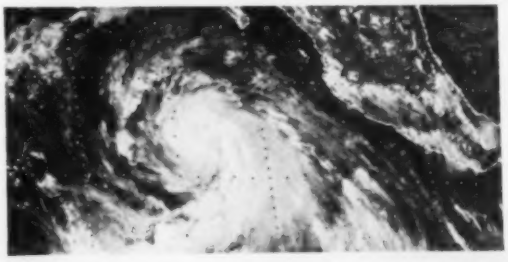

Figure 9.--Hurricane Javier with 95- to 100-kn winds near 16.6°N, 113.9°W, at 2316 on August 24.

moved west-northwestward, then northwestward, passing 80 mi south of Clarion Island at 0400. Winds continued at 100 kn through 1200 and then began to decrease as the cyclone moved over cooler 80°F water. At 0600 on the 27th winds were down to 55 kn and the cyclone was downgraded to a tropical storm near 20.1°N, 123.1°W. Javier moved west-northwestward for another 12 hr, then turned north-northwest toward an upper-level trough off the west coast of the United States. By the 28th his winds were down to 30 kn and the storm was downgraded to a depression. The container ship COLUMBUS VIRGINIA was 230 mi to the northwest.

The final advisory on Javier was issued at 0000 on the 29th.

HURRICANE KAY - SEPTEMBER 16-30

Two and a half weeks elapsed before the next disturbance was found 180 mi south of Acapulco on September 14. It moved west-southwestward for 24 hr, then westward, and was upgraded to a tropical depression on the 16th. The cyclone then turned west-northwestward and the winds increased to 35 kn by 1200 and Kay was named near 12.8°N, 104.6°W. By 0600 on the 17th Kay was upgraded to a hurricane with 65-kn winds near 13.9°N, 106.4°W. The VLADIMIR MAYAKOVSKIY, 70 mi to the north-northeast of the storm sent an important observation. Kay passed 150 mi south of Socorro Island at 0800 September 18. By 1800 the hurricane was moving at 18 kn and the winds had reached their maximum intensity of 120 kn. By 1200 on the 20th the winds were down to 55 kn over 78°F water and Kay was downgraded to a tropical storm near 18.1°N, 123°W. Winds diminished to 45 kn by 1800 and held steady for the next 18 hr before increasing again as the storm, still moving westward, turned slightly to the south over warmer water. On the 22d Kay had 55-kn winds near the center. The winds increased to 70 kn by the 23d, and Kay was again upgraded to a hurricane near 18.5°N, 133.5°W (fig. 10). Kay crossed 140°W longitude and into the Central Pacific Hurricane Center's (CPHC) area of responsibility at 1400 on the 24th. (See the article on central North Pacific tropical cyclones, p. 161.)

Figure 10.--Hurricane Kay with a well-defined eye and 70-kn winds near 18.5°N, 133.4°W, at 2315 on September 22.

TROPICAL STORM LESTER - SEPTEMBER 21-25

The thirteenth cyclone of the season had its origin 100 mi south of Acapulco on September 20. Within 24 hr cyclonic circulation could be seen on satellite imagery and the disturbance was upgraded to a tropical depression. The DELTA AMERICA was 100 mi to the northeast. Winds increased to 35 kn by 1800 on the 22d and tropical storm Lester was born about 220 mi east-southeast of Socorro Island. The TSU, SOVEREIGN VENTURE and TOYOTA MARU were among those reporting near the storm. Moving around the southern side of an upper level HIGH, the cyclone continued on a westerly track. At 0600 an the 23d Lester was 130 mi southeast of Socorro Island (fig. 11). The GARDENIA was 160 mi west-northwest of the cyclone. On the 24th Lester turned eastward and began to weaken under an upper level trough moving across northwestern Mexico. He was downgraded to a tropical depression near 17.5°N, 110.4°W, at 1200.

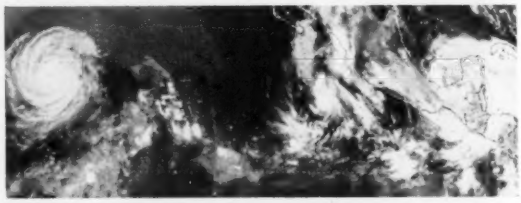

Figure 11.--Infrared satellite image of tropical storm Lester with 35-kn winds near 17.3°N, 109.1°W. Hurricane Kay can be seen to the west, and tropical storm Hermine is over the Yucatan Peninsula.

TROPICAL STORM MADELINE - OCTOBER 11-12

Two week passed before the next cyclone of the season began 200 mi east of Clipperton Island on October 9. The disturbance drifted northward for 12 hr, then turned west-northwestward over 85°F water, and began to intensify. The winds near the center increased from 25 to 35 kn by 0600 on the 11th, and the depression was upgraded to tropical storm Madeline near 12.8°N, 108.8°W. Turning northwest then north-northwest, Madeline was moving around the western side of an upper level HIGH off the west coast of Mexico. By 1800 the storm was near 14.1°N, 110°W. As the cyclone moved north-northwest it passed over cooler water and weakened. By the 12th the winds were down to 30 kn, and the storm was downgraded to a depression near about 230 mi south of Socorro Island.

TROPICAL STORM NEWTON - OCTOBER 28-29

Tropical storm Newton, the final cyclone of the season, began 375 mi south-southeast of Socorro Island on October 26. The disturbance intensified over 83°F water and was upgraded to a depression at 0300 on the 28th. It then turned north-northeastward toward an upper level trough over northwest Mexico. The depression was upgraded to tropical storm Newton about 120 mi south-southeast of Socorro Island at 0600. Turning slowly toward the northeast, Newton began to move at 9-kn toward the Mexican coast. Newton barely made the storm category with 35-kn winds. A combination of cooler water upper level wind shear weakened him rapidly and he was again a depression by 0600 on the 29th. The final advisory was issued at 1200.

Mariners Weather Log

CENTRAL NORTH PACIFIC TROPICAL CYCLONES, 1980

Andrew K. T. Chun
Central Pacific Hurricane Center
National Weather Service, NOAA
Honolulu, Hawaii

Two tropical cyclones affected the central North Pacific this year--Carmen and Kay. Both reached storm strength in other areas of responsibility and then moved into the central Pacific. The embryo of Carmen was first spotted west of 180°, then moved east of 180°, and then back into the western area before reaching storm strength and being named Carmen. Table 6 gives some statistics of the cyclones.

Table 6.--Central North Pacific tropical cyclone data, 1980[1]

Name	Dates	Maximum class	Maximum sustained winds (kn)	Total hours observed
Carmen	April 7-8	Tropical storm	E50 (NESS)	24(TS), 18(TD)
Kay	Sept. 24-30	Hurricane	E75 (NESS)	66(H), 42(TS) 30(TD)

[1]Data pertains only to period storm was in the central Pacific.

Total hours observed per class: Hurricane (H) - 66
Tropical storm (TS) - 66
Tropical depression (TD) - 48

TROPICAL STORM CARMEN - APRIL 4-8

Tropical storm Carmen began as an active cluster of convective activity centered near 4°N, 178°W, on April 3. The Central Pacific Hurricane Center (CPHC) and its supporting National Earth Satellite Service (NESS) unit classified the developing activity as a tropical depression with winds of 25 to 30 kn. The Weather Service Forecast Office, Honolulu, gave official recognition of the tropical depression's existence in their regularly issued High Seas Warnings and Forecasts from 1700 on the 3d to 1700 on the 4th. During this period the low center moved due north at about 12 kn and exhibited intensifying characteristics.

By 1700 on the 4th the storm showed a drift toward the northwest. CPHC in concert with the Joint Typhoon Warning Center (JTWC) deemed it appropriate to begin issuing tropical cyclone bulletins on the 5th. This was the beginning of tropical depression 2 (T.D. 2). The history of Carmen's movement is shown in figure 12.

T.D. 2 intensified rapidly to tropical storm Carmen by 1200 on the 5th and reached its maximum intensity of 60 kn by 1200 on the 6th. Figure 13 shows the storm a few hours after she was given a number. JTWC issued bulletins 1 through 10, then relinquished responsibility to CPHC, which issued its first bulletin at 0600 on the 7th and continued with six more. The last bulletin was issued at 1800 on the 8th.

Upon reaching latitude 20°N, Carmen came to an abrupt halt for nearly 24 hr, during which time she weakened and ultimately met her demise. The system remained over water the entire time and had no direct affect on any islands. There were no reports of damages or casualties to ships.

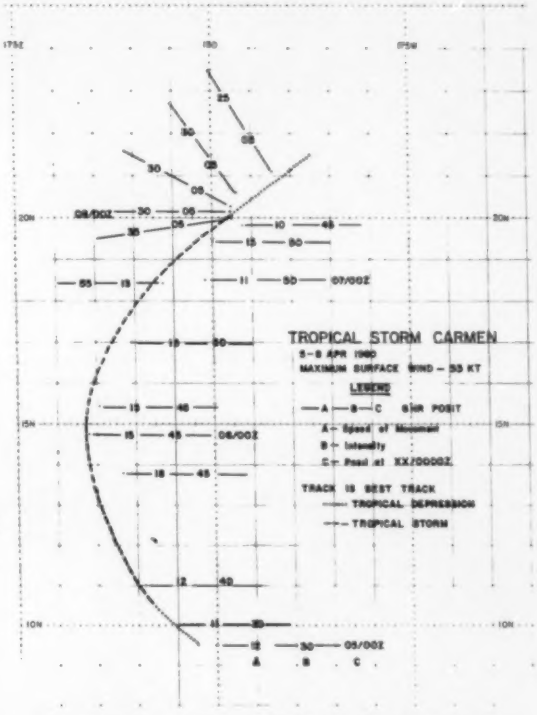

Figure 12.--Track of tropical storm Carmen.

HURRICANE KAY - SEPTEMBER 15-30

Hurricane Kay (T.D. 12) began near 13°N, 103°W, on September 15. The first advisory was issued by the Eastern Pacific Hurricane Center (EPHC) at 0600 on the 16th. The cyclone intensified rapidly to tropical storm Kay and subsequently to hurricane Kay.

Kay crossed into the CPHC area of responsibility (140°W) between 1200 and 1800 on the 24th with maximum sustained winds of 80 kn. Kay continued to move northwestward for the next 48 hr and then became quasi-stationary. At this time, the eye of Kay was obscured, so her movement for the next 24 hr was uncertain. It appeared that Kay had become sta-

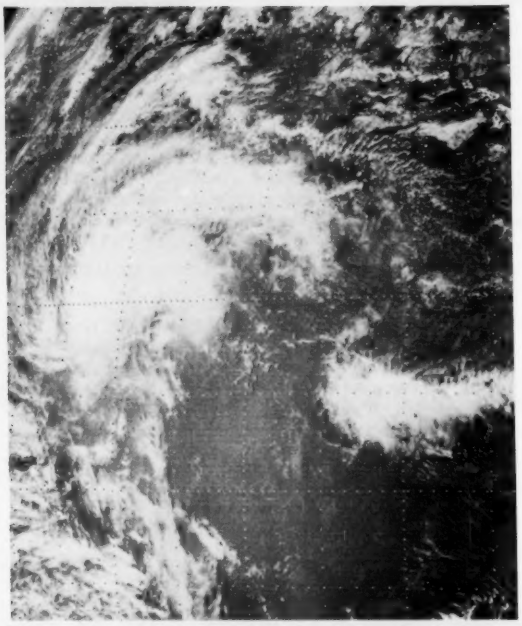

Figure 13.--Tropical depression 2 near 5°N, 178°E, moving north-northwestward at 0219 on the 5th and intensifying. It was upgraded to tropical storm Carmen at 1200.

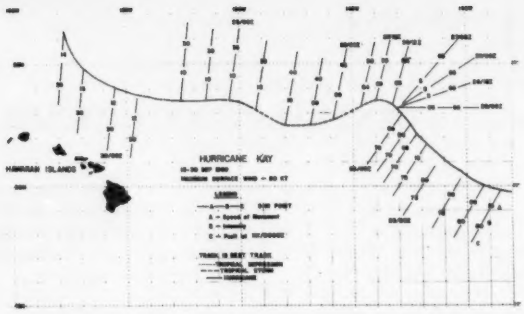

Figure 14.--Track of hurricane Kay west of 130°W.

tionary, but she was actually doing a small loop prior to continuing her westward movement. The steering toward the west was influenced by the rapid movement to the east of higher latitude troughs, causing Kay's direction of movement to vary between southwest and northwest.

Kay was downgraded to a tropical storm at 1200 on the 27th and to a tropical depression at 0600 on the 29th. The storm met its demise under the influence of a deep upper level trough as it moved toward the Hawaiian Islands. As a tropical depression the remains of Kay passed within 200 mi to the northeast of Honolulu moving on a northwesterly track (fig. 14). The satellite photo in figure 15 shows Kay at tropical storm intensity passing to the northeast of the Hawaiian Islands.

Figure 15.--Tropical storm Kay passing 300 mi northeast of Hilo, Hawaii, is weakening rapidly and was downgraded to a tropical depression at 0600 on the 29th.

Mariners Weather Log

GREAT LAKES NAVIGATION SEASON, 1980

Elwyn E. Wilson
Environmental Data and Information Service, NOAA
Washington, D.C.

The 1979 season on the Great Lakes continued into 1980 as the Soo Canal did not close until January 15, 1980. It reopened on March 24, 1980, the same day as the St. Lawrence Seaway and the Welland Canal. The Soo Locks had operated continuously since March 18, 1977. The St. Lawrence Seaway had its shortest winter shut-down, 92 days. The first passages through the Seaway were the WELSH VOYAGER upbound and the CANADIAN OLYMPIC downbound. The first boats through the Welland were the H.J. GRIFFITH upbound and the TADOUSSAC downbound. A few boats operate in the Lakes all winter, particularly those carrying petroleum products. The HENRY FORD II initiated the coal trade on March 3 with its arrival in Toledo from Detroit. The S.T. CRAPO loaded cement at Alpena on March 20, and the FRONTENAC loaded iron ore on March 22 at Marquette. The Greek freighter THEANTO A.S. completed the earliest passage by a saltie through the Welland on March 29 and the Soo Locks on the 31st. She was followed by the PHILIP R. CLARKE, the first U.S. laker. The last salt-water vessel to leave the Lakes was the Brazilian general cargo vessel AMALIA (fig. 16).

The water levels of Lakes Michigan, Huron, St. Clair, and Erie were above normal all year. Lakes Superior and Ontario averaged slightly above to near normal levels.

Precipitation over the Basin was 4 percent above normal, with only the Lake Superior basin 1 percent below the 80-yr normal (table 7).

Figure 16.--The Brazilian general cargo vessel AMALIA (525 ft) was the last overseas ship to leave the Lakes in 1980. Passing down the Detroit River at noon on December 12 in the photo, the AMALIA cleared the Welland Canal about midnight on the 13th and left the St. Lambert Lock (Montreal) at 0047 on the 17th. Photo by Albert G. Ballert.

Table 7. -- Annual precipitation data (in) for 1972-80

	Great Lakes	Lake Ontario	Lake Erie	Lake Huron	Lake Michigan	Lake Superior
1972	35.97	43.67	39.70	35.32	34.97	32.22
1973	33.87	38.16	37.01	33.34	33.98	30.84
1974	28.94	33.42	34.14	25.92	32.77	23.86
1975	34.62	38.53	38.95	34.58	35.74	29.81
1976	31.06	40.92	35.88	33.43	26.54	25.97
1977	38.84	44.26	42.79	37.04	34.42	39.93
1978	32.25	34.08	32.38	31.39	33.67	30.99
1979	35.86	38.21	38.82	35.78	33.18	35.69
1980	32.93	36.87	35.86	33.90	32.11	29.59
1900-80 average	31.76	34.67	34.06	31.51	31.38	29.81
1980 % of average	+04	+06	+05	+08	+02	-01

NATIONAL WEATHER SERVICE AIDS

The National Weather Service (NWS) provided the marine community on the Great Lakes with a full range of environmental prediction services including lake and nearshore forecasts, small craft advisories, gale and storm warnings, special marine storm reports, lakeshore warnings and statements, ice forecasts, and freezeup and breakup outlooks. These products were disseminated to marine users via NOAA Weather Radio, Coast Guard radio facilities, Lorain Electronics Corporation stations, and the Central Radio Network.

Highlights of the year included:

- FCC approval of VHF Channel 17 for weather broadcasts;
- The data buoy program was expanded to five environmental buoys on Lakes Superior, Michigan, Huron, and Erie;
- Revised program instructions and guidelines for NWS forecast services;
- Proposed improvements in MAFOR code format;
- Operational trajectory forecast procedures were established at the NWS Forecast Office in Ann Arbor.

The total number of gale and storm warnings (table 8) were down from the previous three seasons. Lake Superior had a slight edge over Lake Michigan with the most warnings. December required the most warnings.

ICE SEASON

Unlike the three previous severe winters, temperatures were nearly normal during the 1979-80 Great Lakes Ice Season. The ice generally formed late in the fall and melted earlier than usual in the spring.

The first few days of January had above-normal temperatures in the western two-thirds of the Lakes and below-normal temperatures on Lakes Erie and Ontario. A storm center developed rapidly in the Rockies on the 5th and moved to the Great Lakes by the 8th. Up to 1 ft of snow fell on northern Michigan, and winds of nearly 70 kn pounded Duluth, blowing down the superstructure of Hallett Company Dock No. 5. Damage was estimated at several million dollars. Cold air behind the storm continued to build the ice cover. Green Bay, Saginaw Bay, and Lake St. Clair were about 90-percent frozen. The West Neebish Channel in the St. Marys River was closed on January 6 by the Coast Guard. Preventive icebreaking was underway in the St. Marys River, Mackinac Straits, and Duluth Harbor. On the 10th the EDWIN H. GOTT sustained $3,000 ice damage in Lake Michigan. By this time shipping traffic had dwindled to only 20 boats still operating on the Lakes. The Sault Ste. Marie locks were closed on January 15.

The normal winter temperature fluctuations frequently allowed the ice cover to grow and decay over short periods of time. Unlike previous winters, ice floes often broke loose from shore-fast ice, creating a hazard for ice fishermen and others. The Coast Guard rescued about 250 people from ice floes during the season. Cold weather returned to the region in the last week of January. By monthend ice coverage was 85 percent on Lake Erie, 70 percent on Lake St. Clair, 95 percent on Saginaw Bay, 50 percent on Lake Huron, 85 percent in the Straits of Mackinac, and 100 percent on the St. Marys River, Whitefish Bay, and Green Bay. Snowfall was notably absent from the Lower Lakes, however, the Upper Lakes received nearly normal snowfall amounts.

Cold weather continued into February with readings about 10°F below normal moderating to within 2° to 3°F of normal by midmonth. In mid-February ice cover

Table 8. --Gale and storm warnings by lake, 1980

	Superior		Michigan		Huron		St. Clair		Erie		Ontario		St. Lawrence	
	G	S	G	S	G	S	G	S	G	S	G	S	G	S
January	6	2	7	2	3	2	2	1	4	2	-	-	-	-
February	1	0	1	0	1	0	0	0	1	0	-	-	-	-
March	2	0	3	0	2	0	1	0	4	0	-	-	-	-
April	4	0	5	0	2	0	0	0	2	0	1	0	0	0
May	1	0	0	0	0	0	0	0	0	0	0	0	1	0
June	1	0	0	0	2	0	0	0	1	0	1	0	0	0
July	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0	0	0	0	0	0	0	0
September	7	0	2	0	4	0	0	0	2	0	1	0	0	0
October	2	1	8	1	3	1	1	0	4	1	4	1	1	0
November	4	0	3	0	5	1	0	0	5	0	2	0	0	0
December	11	2	8	2	5	2	2	0	4	1	5	1	1	0
Total	39	5	37	5	27	6	6	1	27	4	14	2	3	0

was 95 percent on Lake Erie, 80 percent on Lake Huron, 70 percent on Lake Superior, 95 percent in the Straits of Mackinac, and 35 percent on Lake Michigan. By the third week of February warm weather pushed into the Lakes. Rain, rather than snow, was the rule in most areas. The thaw was short-lived, however, for the coldest weather of the winter season spread over the region during the last part of the month. Temperatures fell below zero in all but the southernmost sections, accompanied by considerable snow. On March 2 the temperature fell to -15°F at Syracuse, N.Y., one of nearly 50 records set that morning.

SPRING BREAKUP

The first week of March brought the first decrease in seasonal ice cover on the Lakes. Temperatures remained cold, but early spring sunshine eroded some of the ice cover. By midmonth, temperatures were approaching normal. Rain and milder temperatures melted considerable ice in the Lower Lakes during the last week in March. Lake Erie's coverage decreased from 75 to 30 percent, Lake St. Clair from 60 to 10 percent, Saginaw Bay from 95 to 65 percent, and the Detroit River and St. Clair River became ice-free. Lake Michigan, in general, had a very light ice season.

Typical spring weather with wide variations in temperatures and occasional rain or snow was observed in April. An outbreak of tornadoes occurred on the 8th with 13 reported in Ohio alone. Rain and warm weather rapidly destroyed the ice cover. No better example of the fickleness of April could be found than the weather from the 22d to the 24th. Temperatures at Chicago reached 91°F and at Madison, Wis., soared to 94°F, a full 12°F higher than the previous record for the date. At Marquette a new record of 88°F was set the following day. A cold front passed through the area overnight, and on the 24th 1 to 3 in of snow fell on Milwaukee, Muskegon, and Grand Rapids. Muskegon's temperature fell to 27°F and Alpena's to 24°F, both new records for the date.

In spite of the cold and snow, the heat wave had done its work; the Great Lakes ice cover was diminished to only a few back bays and coves in the northern lakes.

FALL FREEZEUP

Mild weather during September was followed by very cold weather after the first week of October. Water temperatures cooled rapidly throughout the Great Lakes during the cold spell, which lasted into mid-November.

The National Weather Service Forecast Office at Ann Arbor predicted earlier than normal freezeup conditions in the northern lakes and about normal dates of freezeup in the southern lakes. Some shorefast ice was reported in Little Bay de Noc by mid-November, and ice continued to form in quieter bays and shallows over most of the Lakes region.

By mid-December temperatures were about 3°F above normal in southern waters, while frigid cold spread back into the upper Great Lakes. Lake Superior's average temperatures were as much as 12°F below normal. Milder weather in the southern lakes retreated south, and all of the lakes were well below normal through the holiday season and into 1981. Significant ice had formed in the St. Marys River by mid-December, and direct U.S. Coast Guard assistance was needed to move traffic. Several Coast Guard multipurpose tugs were actively breaking ice for the commercial fleet through the end of the calendar year.

Ship traffic was down considerably from the previous year. Grain traffic was the only commodity which continued to move in large volumes right up to the closing of the St. Lawrence Seaway in mid-December. The last saltie locked through the Seaway on December 17 without incident.

The most severe ice conditions around the Great Lakes were in the St. Clair River during the latter half of December. Massive ice jams stopped ship traffic and caused some minor flooding. The Coast Guard icebreaker MACKINAW was pressed into service along with several smaller vessels to free two tugs and a barge which were stuck near Algonac State Park for 3 days just before New Year's Day.

GREAT LAKES OBSERVATIONS PROGRAM

This year the National Climatic Center listed 93 lakers participating in the weather observing program. Weather reports were received from 67. The total number of observations was 16,818--a decrease from the past 2 yr. Table 9 lists the number of observations of gale-force winds or stronger by lake.

There were 51 observations of waves over 12 ft. Two observations were especially noteworthy. The BURNS HARBOR reported 30-ft waves on Lake Michigan at 1800 on December 2 (table 10). December produced the most reports of waves over 12 ft, and Lake Superior had the largest number.

Table 11 lists the highest windspeed over 30 kn by month and lake and the ships measuring that speed. Table 12 lists the highest 1-min windspeed measured on the Great Lakes by U.S. vessels since 1940.

June was the foggiest month with 213 observations of less than 2 mi. It was followed by May and July.

Table 9.--Observations of strong winds

Lake	Gales (34-40 kn)	Strong gales (41-47 kn)	Storm winds (48-55 kn)	Violent storm (56-63 kn)
Erie	14	1	0	0
Huron	48	12	5	0
Michigan	53	21	3	0
Superior	82	35	8	2
Total	197	69	16	2

Table 10.--Highest seas by lake

Lake	Ship	Date	Height (ft)
Erie	PONTIAC J.L. MAUTHE	October 31 December 3 and 13	12
Huron	6 ships	Oct., Nov., Dec.	15
Michigan	BURNS HARBOR	December 2	30
Superior	MESABI MINER ROGER BLOUGH	September 11 December 18	20

Table 11.--Maximum windspeeds over 30 kn by lake and month reported by National Weather Service cooperating vessels

Month	Erie Speed	Erie Ship	Huron Speed	Huron Ship	Michigan Speed	Michigan Ship	Superior Speed	Superior Ship
January			37	IRVING S. OLDS	46	JOHN G. MUNSON	56	IRVING S. OLDS
April	40	IRVING S. OLDS	45	JOHN DKYSTRA	36	HOMER D. WILLIAMS	46	JOHN DYKSTRA
May			35	CHAMPLAIN	48	J. BURTON OLDS	36	HERBERT C. JACKSON
June			40	GEORGE A. SLOAN	45	HERBERT C. JACKSON	35	G.M. HUMPHREY
July	32	PAUL H. TOWNSEND			35	MESABI MINER	44	ARTHUR M. ANDERSON
August					43	J.L. MAUTHE	34	CASON J. CALLAWAY MIDDLETON PHILIP R. CLARKE
Sept.	38	PAUL H. TOWNSEND	44	JOHN DYKSTRA	42	WILLIAM P. SNYDER	46	WILLIAM CLAY FORD
October	40	MYRON C. TAYLOR AMERICAN MARINER	49	BURNS HARBOR	44	AMERICAN MARINER MESABI MINER	52	JOHN DKYSTRA
Nov.	34	PAUL H. TOWNSEND PAUL THAYER	40	AMERICAN MARINER BENJAMIN F. FAIRLESS CLIFFS VICTORY JOSEPH H. THOMPSON	42	BURNS HARBOR	44	J.A.W. IGLEHART
Dec.	44	WOLVERINE	50	WALTER A. STERLING	52	BURNS HARBOR	56	JOHN DYKSTRA

These tables and this article include only those observations logged on Great Lakes Observations Form 72-2 and forwarded to the National Climatic Center.

NOTABLE WEATHER HAPPENINGS

Lake Superior was the stormiest lake, and December was the worst month. The highest measured wind was 56 kn on Lake Superior in January and December by the IRVING S. OLDS and JOHN DYKSTRA respectively. There were also two measurements of 52-kn winds, one in October by the JOHN DYKSTRA on Lake Superior and the other by the BURNS HARBOR on Lake Michigan in December. The highest waves were 30 ft on Lake Michigan in December by the BURNS HARBOR.

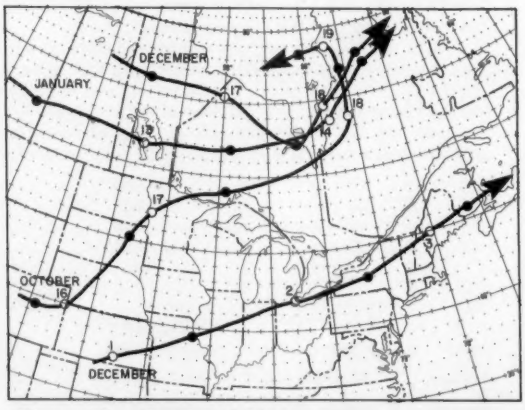

Figure 17.--Tracks of 1980 severe storms on the Great Lakes.

Special observations were logged by the JOHN DYKSTRA and all appeared to be associated with thunderstorms. The greatest ice accumulation was 10 cm on the MESABI MINER on Lake Superior in December. The A.H. FERBERT had 9 cm on Lake Michigan in January and the ST. CLAIR had 8 cm in December on Lakes Superior and Huron.

Data and numbers must be evaluated in terms of the season and number of ships operating. The most severe, widespread storms are likely to occur when fewer ships are operating.

The following paragraphs describe by month some of the more significant weather as indicated by the observations. February and March are not covered. Figure 17 shows the tracks of the most severe storms.

JANUARY

The three major storms of the month occurred in the first 2 weeks. During the second half of the month the Basin was generally under the influence of high pressure. The first severe storm came out of Wyoming on the 6th. Before the day was over, storm warnings were posted for all the lakes except Ontario. Very few ships were operating. The storm moved nearly directly over Sault Ste. Marie at 1200 on the 7th, where the winds gusted to 61 mi/hr (53 kn). The A.H. FERBERT on Lake Michigan had 42-kn winds from 250°. She was carrying 9 cm of ice. The EDWIN H. GOTT was also on Lake Michigan with 45-kn winds. Shore flooding and beach erosion warnings were in effect for Lake Erie. Blizzard conditions existed in many areas. As the storm moved over Quebec, it weakened.

The second storm followed right on the heels of the first. It also came out of the west and caused an all-time low-pressure record of 28.85 in at Rapid City, S.Dak. The storm was centered over western Lake

Table 12.--Highest 1-min wind (kn) reported on the Great Lakes by U. S. anemometer-equipped vessels

Year	Lake Erie		Lake Huron		Lake Michigan		Lake Superior		Lake Ontario	
1941	W	42	WSW	50	NW	43	NNW	54	--	--
1942	WSW	52	WSW	56	WNW	48	S	62	--	--
1943	WSW	57	WNW	43	SSW	50	WSW	52	--	--
1944	NE	38	NW	37	WSW	48	NNE	42	--	--
1945	WNW	52	SSW	54	WNW	49	NW	52	--	--
1946	SW	50	W	46	S	44	NW	47	--	--
1947	NW	51	SSE	43	ENE	39	WSW	43	--	--
1948	WSW	40	NNW	51	NW	45	WSW	48	--	--
1949	W	52	NNE	50	NNW	43	N	52	--	--
1950	SW	70	NW	48	NW	49	NW	81[1]	--	--
1951	WSW	37	WSW	50	SW	49	WSW	54	--	--
1952	SW	46	SW	57	SSW	44	WSW	45	--	--
1953	WSW	49	NW	45	NNW	46	ENE	50	--	--
1954	W	45	NW	45	E	48	N	43	--	--
1955	W	52	SW	57	WSW	58[1]	NW	48	--	--
1956	WSW	46	W	43	SSW	46	N	50	--	--
1957	WSW	72	SW	54	WSW	49	W	47	--	--
1958	SW	61	SW	43	SW	52	SSW	54	--	--
1959	W	42	NE	50	E	48	W	54	--	--
1960	NE	55	WSW	49	NW	55	N	54	--	--
1961	W	50	NW	47	NW	48	N	57	--	--
1962	NW	52	WNW	63	NW	48	NNW	60	--	--
1963	NNW	74	NW	60	N	52	NNW	52	E	35
1964	WSW	68	W	72	NW	54	WSW	62	WNW	50[1]
1965	WSW	60	WNW	95[1]	ESE	52	SW	70	W	40
1966	ENE	49	NE	60	NW	57	NNE	61	W	39
1967	WSW	43	W	58	ENE	55	N	53	W	32
1968	W	63	NNW	44	WNW	46	NNE	55	SW	31
1969	WSW	44	NNW	46	NW	50	SSW	50	--	--
1970	W	52	W	62	NW	52	W	63	--	--
1971	SW	50	N	53	N	50	SW	56	--	--
1972	W	45	NW	56	N	54	NNE	60	--	--
1973	SW	45	ENE	44	NE	56	NE	50	--	--
1974	ENE	48	SW	47	SW	42	ESE	46	W	38
1975	NE	40	WSW	60	SW	54	W	50	NW	32
1976	W	48	S	56	NNW	55	NE	54	W	34
1977	WSW	44	SE	48	ESE	44	SW	56	NW	26
1978	SSW	80[1]	ENE	50	E	55	S	56	WNW	33
1979	W	42	W	44	WNW	55	NNE	52	W	26
1980	NNE	44	N	50	NNE	52	S	56	--	--

[1]Highest for each lake

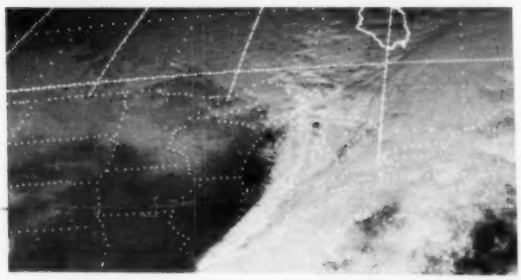

Figure 18.--GOES-1 clearly shows the cold front just east of Lake Michigan at 1700 January 11.

Superior at 1200 on the 11th (fig. 18). By 0000 on the 12th it was 968 mb (28.59 in) near James Bay. The JOHN G. MUNSON on Lake Michigan had westerly winds up to 46 kn, and the EDWIN H. GOTT again recorded winds of 45 kn out of the northwest. Waves up to 15 ft were forecast for the eastern shore of Lake Michigan and up to 10 ft for the southeastern shore of Lake Erie. Cleveland, Ohio, reported gusts to 58 mi/h (50 kn). Gusts to 60 mi/h were found at Chicago and Buffalo. At Sault Ste. Marie the temperature rose to 44°F on the 11th before plunging to near 0°F early on the 12th. By 0000 on the 13th the center of the storm was over Ungava Bay.

High pressure moved rapidly eastward along the Ohio River, and the eastern fringes of a third storm were brushing Lake Superior on the 13th. At 0600 the IRVING S. OLDS on Lake Superior found 56-kn

southerly winds. Four other ships on the lake had gales: the CASON J. CALLAWAY, EDWIN H. GOTT, ENDERS M. VOORHEES, and JOHN G. MUNSON. By the 14th the storm was north of Thunder Bay and had weakened to less than gale strength.

APRIL

This is a transition month and about every 4 to 5 days a cyclone moved close enough to affect the Great Lakes Basin. Three storms had winds of 40 kn or greater. The first came out of the southwest on the 8th. The EDWIN H. GOTT caught 40-kn gales late that day on Lake Superior. The COURTNEY BURTON was approaching Duluth Harbor and winds, waves, and ice forced her to broach toward the ship canal breakwall. The captain had to drop anchor to avoid colliding with the breakwall, then only 150 yd away (fig. 19). On the 9th the storm was south of Green Bay, and the PHILIP R. CLARKE logged 43-kn winds from the northeast on Lake Superior. The cyclone moved slowly over the Lakes, but luckily the winds had weakened considerably. The MACKINAW returned to Cheboygan, Mich., on the 10th after 3 weeks of breaking ice on Whitefish Bay.

This storm moved northward from the Gulf of Mexico. Its easterly circulation reached Lake Erie by 1200 on the 14th. The IRVING S. OLDS had moved to southerly climes but found 40-kn northeasterly winds. By 1200 on the 15th the 990-mb storm was north of Lake Erie. There were near gales over the Lakes. Strong northerly flow moved over Lake Huron on the 16th, and the JOHN DYKSTRA measured 45-kn northerly winds. On the 17th high pressure was over the area.

This was a western storm. It traveled eastward slightly north of the Canadian border. Gales were over Lake Superior late on the 22d. The JOHN DYKSTRA was back on that lake on the 23d with northwesterly winds of 46 kn at 0600 and 45 kn at 1200. The center dissipated not long after 1200 leaving an inverted trough. This storm brought record-breaking high temperatures ahead of it. Many stations had temperatures in the high 80's. Detroit reached 87°F, breaking the old record by 5°F. By the morning of the 24th the temperatures were again below freezing.

MAY

The Great Lakes Basin was under high pressure in the mean as indicated by the monthly mean-pressure chart. The cyclones that traversed the region were generally weak, and others passed to the south and east. There were only 14 observations of winds grea-

Figure 19.--The Duluth, Minn.-Superior, Wis., harbor is the leading Great Lakes center for bulk cargo shipments. In the foreground are Duluth iron ore docks and across the St. Louis River in Superior are the loading dock and storage area for western low-sulphur coal. The view also shows some of the twin port's grain elevators which shipped 8.1 million metric tons of grain and oilseeds in 1980. Photo by Albert G. Ballert.

Figure 20.--The 480-ft midsection of Hull 909, now the WM. J. DELANCEY, being towed on May 19 from the Toledo yard of American Ship Building Co. to be completed in Lorain, Ohio. The DELANCEY, christened on April 25, 1981, is 1,013.5 ft overall, the largest vessel on the Lakes. Photo by Albert G. Ballert.

ter than 30 kn and 6 of these were associated with a storm on the last day.

This storm formed over eastern Colorado on the 29th. It started moving northeastward on the 30th. By 0000 on the 31st it was centered over Green Bay at 1000 mb. The J. BURTON AYERS was on Lake Michigan with 48-kn westerly winds in fog with the visibility less than 50 m. During the rest of the day the CHAMPLAIN, HENRY FORD II, HERBERT C. JACKSON, T.W. ROBINSON, and WILLIAM CLAY FORD reported gales up to 36 kn on Lakes Huron, Michigan, and Superior. By June 1 the storm was north of Quebec, and a small HIGH was over the Basin.

The first week of the month there were some record-setting high temperatures and fog; by the 9th there were frost warnings. The middle of the month there was more fog. There were three tornadoes near Detroit, heavy rains, high winds, and hail with the above storm. There were 1,403 vessel passages locked through the canal at Sault Ste. Marie. The 480-ft midsection of Hull 909 (fig. 20) was towed from Toledo to Lorain, Ohio. It became part of the 1,013.5-ft WM. J. DELANCEY, the largest vessel on the Lakes, which was christened April 25, 1981.

JUNE

This was a rather blah month as far as pressure systems were concerned. Most were not intense and skirted the area. Fog and thunderstorms were the primary meteorological phenomena. On the 10th and 16th there were record-breaking cold temperatures.

There were two cyclones that produced winds over 30 kn, and in both cases in the northerly flow. The first storm moved over the central lakes late on the 7th. On the 8th there were reports of gales on Lakes Huron and Michigan. The storm traveled northeastward then northward over Quebec Province. A front plunged southward out of Canada late on the 9th. On the 10th there were gales over Lake Superior, and the HERBERT C. JACKSON measured 42-kn winds on Lake Michigan. By afternoon a ridge of high pressure was over the area.

A frontal wave moved across the northern plains and was near Chicago on the 19th. By 1800 the 1006-mb center was over lower Michigan. The HERBERT C. JACKSON was on Lake Michigan with 45-kn winds from the north. Six hours later the 40-kn winds found the GEORGE A. SLOAN on Lake Huron. By the 21st the storm was near Montreal, and high pressure covered the Lakes.

JULY

Most cyclone centers followed a path north of the Great Lakes. Fronts and frontal waves were the primary weather makers, and severe weather was associated with thunderstorms. There were only six reports by cooperating ships of winds greater than 30

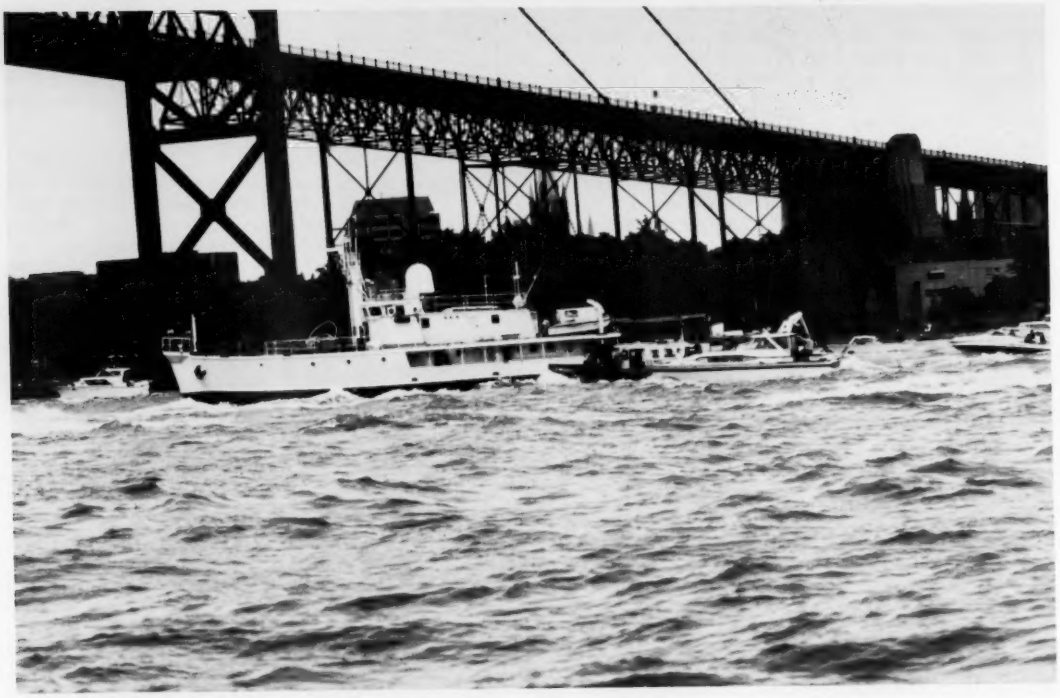

Figure 21.--Jacques Cousteau's research vessel CALYPSO is enroute to Lake Superior in September for filming of the freighter EDMUND FITZGERALD, which sank in a storm on November 10, 1975. Photo by Albert G. Ballert.

kn. The highest measured was 44 kn on Lake Superior by the ARTHUR M. ANDERSON at 1800 on the 9th. There was a weak LOW over Hudson Bay, and the lake was in weak west-southwesterly flow. Land stations were reporting thunderstorms.

AUGUST

This was a repeat of July. Again, there were only six reports of winds greater than 30 kn. The highest was 43 kn by the J.L. MAUTHE on Lake Michigan at 0600 on the 5th. She had experienced a thunderstorm during the past hour. A LOW was moving from near Lake Winnipeg to Hudson Bay. The storm occurred as the warm front moved northward over the lake.

SEPTEMBER

The number of high winds increased considerably to 84 this month. The weather pattern was about the same as during the summer, but the storm systems passed closer to the Lakes and were more intense. The highest wind occurred early in the month on the 5th on Lake Superior. The WILLIAM CLAY FORD measured 46 kn at 0000. Six hours earlier the IRVING S. OLDS had measured 45 kn. A 990-mb LOW was moving from near Lake Winnipeg to upper James Bay with the cold front sweeping eastward across the Lakes.

Another storm that brought winds over 40 kn moved over Lake Superior on the 20th. There were quite a few gale reports on the 0600 and 1200 observations. Three ships had 42-kn winds: the EDWIN H. GOTT on Lake Superior, the HENRY FORD II on Lake Huron, and the WILLIAM P. SNYDER JR. on Lake Michigan.

The storm which brought the greatest number of gale reports passed through the Straits of Mackinac about 1800 on the 25th. This storm treated all the lakes except Ontario to gales. The LEON FRASER found the highest winds of 45 kn on Lake Superior with the 0000 observation on the 26th. Most of the high winds were from the north behind the LOW. The JOHN DYKSTRA measured 44-kn winds with rain showers on Lake Huron.

Ideal conditions prevailed on Lake Superior on the 24th, which made it possible for the oceanographic research vessel CALYPSO (fig. 21) to anchor above the EDMUND FITZGERALD. Divers spend 30 min on the bottom in a miniature submarine filming the wreck. The CALYPSO was then scheduled to make sonar graphs of the wrecks along Long Point in Lake Erie and visit the wrecks of the American warships HAMILTON and SCOURGE, which sank during a violent storm in 1813 in Lake Ontario.

OCTOBER

Fall had truly set in over the Great Lakes. The storm systems now tracked much closer to the Lakes and with the greater contrast of temperatures between air masses could become very intense. All the lakes experienced gales. No winds greater than 40 kn were reported on Lakes Erie and Huron. There is a high

probability they occurred, however, but ships with wind-measuring equipment were not there to report them.

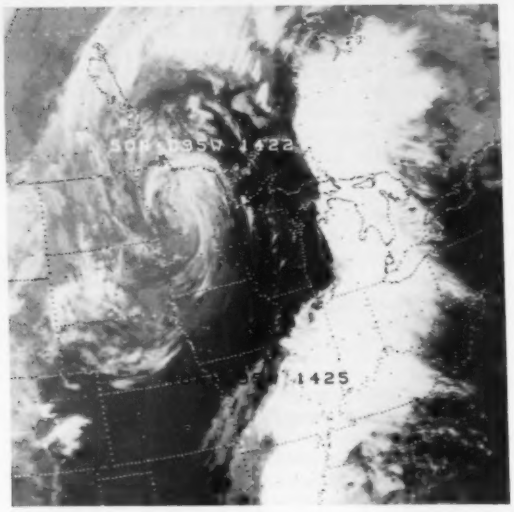

Figure 22.--JOHN DYKSTRA reported the highest wind (52 kn) for October in this extratropical cyclone.

On the 11th a LOW moved southeastward out of Canada, just north of the Lakes. Gale-force northerly winds were measured on Lake Superior. On the 12th they spread onto Lake Huron. The BURNS HARBOR found 49-kn winds out of the northwest at 0600. After 1200 the storm turned northeastward and the gradient relaxed.

The next storm came out of Colorado and moved northward to the Red River, where it turned northeastward to pass over Thunder Bay at 990 mb. Late on the 17th there were a few gales reported. The AMERICAN MARINER found 49-kn winds out of the south on Lake Superior. The JOHN O. MCKELLAR had storm damage on Lake Superior (fig. 22). On the 18th there were several reports above 40 kn on Lakes Superior and Michigan. At 0600 the JOHN DYKSTRA took the prize for the month with 52-kn winds from the west on Superior. The WOLVERINE measured 42 kn on Lake Michigan. The AMOCO-ILLINOIS found 15-ft waves on Lake Michigan. By the 19th the winds were less than gale force.

This storm was the combination of two cyclones. On the 24th there was a frontal wave west of Chicago and another east of Jacksonville, Fla. The western LOW moved northeastward over Lake Superior on the 25th and brought gales to Lakes Huron, Michigan, and Superior as the southern LOW moved northward up the coast. By 0000 on the 26th the coastal storm was the primary circulation, and by 1200 it was 973 mb near Montreal. Winds greater than 40 kn were found on the three upper lakes. Warnings were posted for all the lakes. The GEORGE A. SLOAN had 45 kn on Lake Huron and again on the 27th. By the morning of the 27th the LOW was centered over northern Quebec. The car ferry CHIEF WAWATAM collided with the dock at St. Ignace, Mich., in high winds and rough water.

NOVEMBER

This month is noted for bad storms, but fortunately this was not the case this year. There were only two cyclones that produced winds over 40 kn and only three reports of waves greater than 12 ft.

A LOW moved eastward out of southern Alberta on the 8th. By 0000 on the 9th it was over Duluth at 993 mb and the winds increased to gale force over the three larger lakes. At 0600 the J.A.W. IGLEHART measured 44-kn southeasterly winds with rain and snow mixed on Lake Superior. The storm continued its eastward track, and at 0000 on the 10th the BURNS HARBOR had 42 kn on Lake Michigan. By 1200 gales had reached Lake Erie. Gales continued into the 11th on Lake Huron

Figure 23.--The 1,000-ft EDGAR B. SPEER, downbound in the Detroit River. It was the eleventh vessel of this length on the Lakes when it entered service in September. Another 1,000 footer completed in 1980 was the BURNS HARBOR. Photo by Albert G. Ballert.

as high pressure pushed into the area.

A small storm came out of the vicinity of Winnipeg on the 20th. It was 1007 mb near Sault Ste. Marie at 1200 on the 21st. Gales were blowing on Lakes Huron, Michigan and Superior. The GEORGE A. STINSON measured 42-kn northerly winds on Lake Superior at 0600. Isolated gales continued into the 22d.

DECEMBER

Even though several deep LOWs passed over or near the Great Lakes this month, the mean sea-level pressure was above normal. The highest reported measured wind and waves of the year occurred this month, but not with the same storm.

The first storm formed over the Oklahoma Panhandle on the 1st. By 1200 on the 2d the 1002-mb storm was near Toledo, Ohio. Winds up to 40 kn were reported on all the lakes except Ontario. The BURNS HARBOR (fig. 23) was on Lake Michigan with 52-kn winds at 1200. At 1800 the winds were 45 kn and their seas were encoded as 30 ft. By 1200 on the 3d the 994-mb storm was east of Montreal. The CHAMPLAIN was on Lake Erie with 40-kn winds. High pressure dominated the Basin later in the day.

A storm roared across the Lakes on the 12th and 13th, bringing gales to the three upper lakes. On the 13th the PHILIP R. CLARKE had 50-kn northwesterly winds on Superior; others were in the 40's. On the 14th a front generated out of a trough and plunged southeastward across the Basin. Winds in the 40-kn range were found on Lakes Huron, Michigan, and Superior. The WALTER A. STERLING had 45 kn on Lake Huron. By the 15th high pressure had moved in again.

This storm formed north of Lake Winnipeg on the 16th and traveled eastward. Its southerly circulation was over the Lakes on the 17th. At 1800 the storm was 985 mb south of Fort Severn (fig. 24). At that time the JOHN DYKSTRA was on Lake Superior east of the front with 56-kn southerly winds; the fastest of the year. The waves were only 8 ft. On the 18th the J.A.W. IGLEHART found 48 kn on Lake Huron. At 0000 on the 19th the LOW was over northern Quebec. The ARTHUR M. ANDERSON on Lake Superior measured 50-kn northwesterlies. Strong northerly flow was plunging southward from a 1059-mb HIGH over the Yukon. The LAKESHELL ran aground in Parry Sound in near gale-force winds and heavy ice.

During the month Sault Ste. Marie established a December record with 11.6 in of snow in 24 hr and a total fall of 55 in during the first 3 weeks.

In the third week of the month several ships became stuck in ice in St. Marys River and navigation was restricted and stopped. During the last few days of the month ice jams on the St. Clair River trapped ships that had to be freed by icebreakers.

ACKNOWLEDGMENTS

Appreciation is extended to the masters and mates aboard the cooperating vessels for their valuable observations and contribution to the National Weather Service observing program. Useful information and photographs were contributed by Albert G. Ballert of the Great Lakes Commission. The National Weather Service provided data on warnings and the ice season.

Of primary importance were the listings of wind, wave, visibility, ice, and special observations prepared by the Primary Data Branch of the National Climatic Center, upon which much of the specific weather information is based.

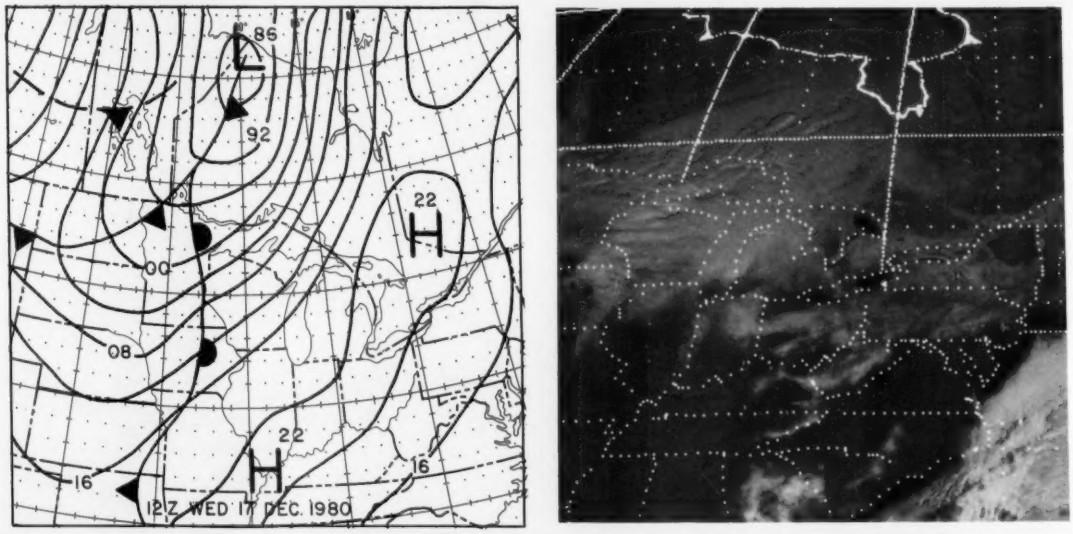

Figure 24.--The highest wind (56 kn) of the year was reported by the JOHN DYKSTRA on Lake Superior in this storm. The visible image satellite photo does not clearly define the storm due to the lack of light.

Hints to the Observer

HURRICANE REPORTING LETTER

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE
Silver Spring, Md. 20910

MAY 29 1981

OA/W521x2/JWN

Dear Captain:

Because of the number of tropical storms and hurricanes between June 1 and November 30 the period has been designated as the hurricane season. Many special programs in response to this threat are started on June 1 including this alert letter to ships that we service. We also request a change in your observation schedule when in the vicinity of a tropical storm or hurricane as follows:

1. When within 300 miles of a tropical storm or hurricane, transmit weather observations at least every 3 hours.

2. In the "Remarks" section of the Ship's Weather Observations NOAA Form 72-1 (also called the log or record) and in the weather message transmitted by radio, include the lowest pressure and/or the highest wind encountered since the last synoptic (0000, 0600, 1200, or 1800 GMT) report, if:

   a. The pressure was more than 5 millibars lower and/or,

   b. The wind was more than 15 knots higher than the last report. Include the time of occurrence in the radio message and on the record.

3. Use the prefix "STORM" on the weather message. If you are in a named tropical storm or hurricane use the name in the remarks. Example radio message:

   STORM (standard weather report) HILDA 0915Z LOWEST PRES 982MB 0918Z HIGHEST WIND 75 KTS GUSTS TO 100 KTS.

On behalf of your fellow mariners who will benefit from your observations and the National Weather Service, I express our appreciation for your weather observations. I wish you a safe hurricane season.

Sincerely yours,

R. E. Hallgren

Richard E. Hallgren
Director, National Weather Service

GENERAL INSTRUCTIONS FOR RADIO REPORTING OF WEATHER OBSERVATIONS

Standard Synoptic Observation Times -- The regular weather-reporting hours are 0000, 0600, 1200, and 1800 GMT. Occasionally, watch schedules or priority of other duties make it impractical to make and transmit surface observations at standard synoptic times. To ensure message transmission, observations may be made in advance of the weather-reporting hours. In these cases, the actual time of obser-

vation should be included in the report.

Coded Weather Messages--All messages to be transmitted by radio should be transcribed from the ship's weather log to NOAA Form 72-4, "Weather Report for Immediate Radio Transmission," in the World Meteorological Organization (WMO) ship synoptic code FM21V or FM23V and given to the Radio Officer.

Transmission of Radio Messages--Weather messages should be transmitted as soon as possible to the most convenient radio station in accordance with instructions contained in "Radio Stations Accepting Ships' Weather and Oceanographic Observations."

Weather Message Addresses for Transmission to U.S. Radio Stations--Use "OBS METEO WASHDC" when in the:

1. Western North Atlantic, including the Gulf of Mexico and Caribbean Sea, north of 3°N latitude, and west of 35°W longitude (WMO Region IV-A).
2. Eastern North Pacific (north of the Equator), east of the 180th meridian (WMO Region IV-A).
3. Eastern South Pacific (south of the Equator), from the South American coast to 120°W longitude (WMO Region III-B).

Use "OBS METEO GUAM" when in the western North Pacific between 5° and 25°N latitude, and from 135°E to the 180th meridian (WMO GUAM ZONE).

Observations During Storm Conditions--Whenever TROPICAL STORM, TYPHOON, or HURRICANE conditions are encountered anywhere, "SAFETY OF LIFE AT SEA CONVENTION," Chapter V, requires all ships to take a special observation and transmit the report to the closest national meteorological service via the most convenient radio station. In addition to this requirement, it is highly desirable that weather reports be transmitted hourly if possible, but, in any case, not less frequently than every 3 hr.

Special Requests for Observations--During storm situations, the U. S. National Weather Service may request ships located in areas of suspected storm development to take special observations at more frequent intervals than the routine 6-hr synoptic observation times. If your ship happens to be in such an area, your report will be helpful even though conditions may not appear bad enough to warrant a special observation. To speed delivery of messages from storm areas and to identify them as such, the word STORM should appear immediately following the ship's call sign in the radio address. An example of the message format is: "OBS METEO WASHDC ABCD STORM 99305 70750," etc.

Observations in Coastal Waters--Since radio weather reports are always needed from ships in coastal waters, observations should continue to be taken as close to shore as ship routine permits.

Tips to the Radio Officer

Larry Murphy
National Weather Service, NOAA
Silver Spring, Md.

VANCOUVER COAST GUARD RADIO/VAI RUNS TEST BROADCAST

Vancouver Coast Guard Radio (VAI) tested a high-seas weather broadcast service on 4385.3 kHz A3J (SSB suppressed carrier) channel designator 410. The broadcast consisted of weather information for the area of the northeast Pacific Ocean north of 45°N latitude extending from off the Oregon coast to 150°W longitude. The broadcast included British Columbia coastal information of the synopsis, area forecasts for west coast Vancouver Island, the Queen Charlotte and north coast areas, and the further outlook. The broadcast also included spot weather observations in the area of reported wind and sea conditions.

The test ran from February 1 to April 30, 1981. Broadcasts were scheduled daily at 0700 and 2100 PST.

Comments on the broadcast are solicited and may be made by contacting any Canadian Coast Guard radio facility.

SITOR/ARQ BROADCAST OF HIGH-SEAS WEATHER AND MARINE INFORMATION

On April 1, 1981, U.S. Coast Guard Communications Station, San Francisco (NMC) commenced a broadcast in Direct Printing Radioteletype (SITOR/FEC) mode. Each broadcast contains high seas weather synopses for Pacific Ocean meteorological areas A (10°S to 40°N, 78°W to 160°W) and B (North Pacific) and warnings and forecasts for waters 20 to 250 mi offshore from Cape Flattery south to Guadalupe Island. The broadcast is twice daily at 0000 and 1800 GMT on assigned frequencies 8714.5 kHz and 17207 kHz.

NEW MARINE FACSIMILE PRODUCTS AVAILABLE IN PACIFIC

A series of new marine facsimile products are being prepared under a joint program sponsored by NOAA and NASA. The products will be produced by the NWS forecast offices in Anchorage, San Francisco, and Seattle. NOAA/NESS will contribute satellite imagery for the analysis of sea-surface temperature and sea ice; and Ocean Data Systems, Inc., through a contract with NASA/JPL, will provide oceanic analysis and forecast information intended to aid the marine fishing community.

These new products are available from the U.S. Coast Guard Communications stations at Pt. Reyes, Calif., and Kodiak, Alaska, as follows:

Pt. Reyes, CA (NMC)

Time (GMT)	Frequencies (kHz)
0100-1500	4344.1, 8680.1, 12728.1
1700-2300	8680.1, 12728.1, 17149.3

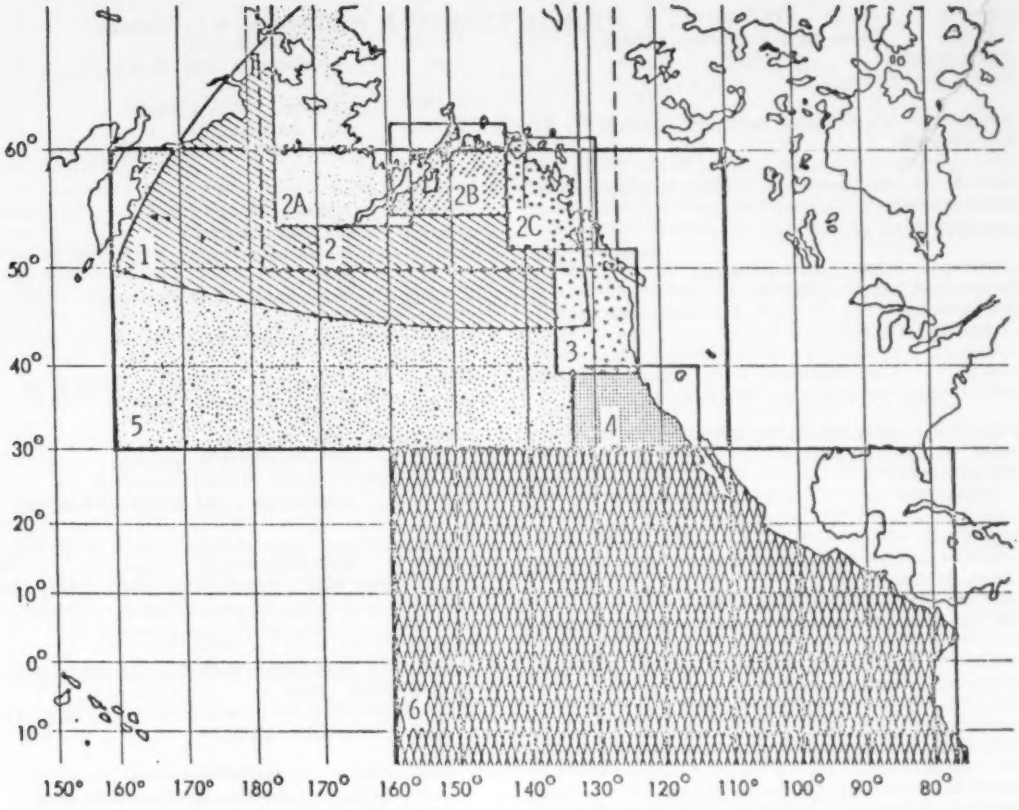

Figure 25.--Areas covered in new marine facsimile broadcasts.

Kodiak, AK

0000-2359 4296, 8457

The six areas to be covered by the products are shown in figure 25.

CORRECTIONS TO WORLDWIDE MARINE WEATHER BROADCASTS (JUNE 1980 EDITION)

Page 8

1-0020 Halifax, N.S., Canada CHF
Change times to 0200, 0630, 1400, 1800, 0230, 1430, 0530, and 1930.

Add new station:
1-0040 Cartwright, Lab., Canada VOK
Area: (See figure 2)
Labrador west, Lake Melville, and Goose Bay.
0220, 0820 S, F, IB
1420, 2020

1-0090 Riviere-Au-Renard, Quebec, Canada VCG
Change times to read: 0050, 1350, 1550.

1-0100 Mont Joli, Quebec, Canada VCF
Change times to read: 0030, 1330, 1530.

Add new station:
1-0105 St. Lawrence, NFld., Canada VCP
Area (See figure 2)
Newfoundland west and Grand Banks
1330, 2230 S, F, I

Page 9

1-0110 Quebec, Quebec, Canada VCC
Change 1220 to read 1320 and add:
1520 434 I

1-0120 Montreal, Quebec, Canada VFN
Delete 0010, 1710.
Change 1210 to read 1310 and add:
1510 420 I

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1-0880 Vancouver, B.C., Canada VAI
Add contents: S, F

1-0930 Honolulu, Hawaii NMO
Add 1300 to times.

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2-0060 Goose Bay, Labrador, Canada VFZ
Add contents: S, F
Delete 2582 (a3H).

2-0070 Cartwright, Labrador, Canada VOK
Add contents: IB

2-0110 St. Lawrence, NFld., Canada VCP
Add contents: I
Add 0220 to times.

2-0130 Canso, N.S., Canada VAX
Delete first 161.65 MHz(F3)
Add contents: S, F (following second 161.65 MHz(F3).

2-0150 Charlottetown, P.E.I.,Canada VCA
Delete times and substitute "continuous."

2-0160 Grindstone, Magdalen Is., Canada VCN
Delete 161.65 MHz(F3).
Add new line:
continuous 161.65 MHz(F3)

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2-0170 Riviere-Au-Renard, Quebec, Canada VCG
Change 1235 to 1335; (A3) to (A3H); 1735 to 1535.
Add "2598 (A3H)" below 2582 (A3H).
Add "S, F, I" as contents of continuous broadcast.

2-0180 Mont Joli, Quebec, Canada VCF
Add footnote reference 2 to F.
Add "I" to contents of continuous broadcast.
Delete 0020, 1220, 1730, do., and S, F, I.
Add footnote 2, Coded forecasts, MAFOR.

2-0190 Quebec, Quebec, Canada VCC
Add "I" to contents.
Add: 161.65 MHz(F3).

2-0200 Montreal, Quebec, Canada VFN
Add: 161.775(F3).

2-0210 Halifax, N.S., Canada VCS
Delete times and frequencies after 2110.

Add:	0205, 0805 1605, 2205	410.1(A3J)	S, F
	0215, 0815 1615, 2215	8787.1(A3J)	S, F
	1625, 2225	13138.0(A3J)	S, F

2-1300 Prince Rupert, B.C., Canada VAJ
Delete: 161.65 MHz(F3)
Add: continuous 161.65 MHz(F3) S, F

2-1310 Sandspit, B.C., Canada VAH
Delete: 161.65 MHz(F3)
Add: continuous 161.65 MHz(F3) S, F

2-1330 Alert Bay, B.C., Canada VAF
Delete: 161.65 MHz(F3)
Add: continuous 162.55 MHz(F3) S, F

2-1350 Tofino, B.C., Canada VAE
Delete: 161.65 MHz(F3)
Add: continuous 161.65 MHz(F3) S, F

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2-1360 Comox, B.C., Canada VAC
Delete: 161.65 MHz(F3)
Add: continuous 162.55 MHz(F3) S, F

2-1370 Vancouver, B.C., Canada VAI
Change 0320 to 0410.
Delete: 161.65 MHz(F3).
Add 2210.
Add: continuous 161.65 MHz(F3) S, F

2-1380 Victoria, B.C., Canada VAK
Change: 0420 to 0320.
Delete: 161.65 MHz(F3).
Add 2054 as frequency of 2250 broadcast.
Add: continuous 161.65 MHz(F3) S, F

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2-1530 Honolulu, Hawaii NMO
Change times 0545, 1745 to read: 0545, 1145, 1745, 2345.

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3-0010 Frobisher, N.W.T., Canada VFF
Add frequency 15644.
Delete times 1815, 0815; add 2300, 1500, 1630, 1700, 1800, 1830, 1940, 2100.
Add:[1]

0405, 1605	Surface Analysis
1030, 2235	Surface Prognosis 48 hrs.
0600, 1800	Weather Depiction Prog. 18 hrs.
0900, 2100	Weather Depiction Prog. 24 hrs.

3-0020 Halifax, N.S., Canada CFH
Delete: 1020 Surface extended prognosis
Change: 2220 to 1000
Add:

0600, 1800	Weather Depiction Prog. 18 hrs.
0900, 2100	Weather Depiction Prog. 24 hrs.

Page 69

3-0305 Esquimalt, British Columbia
Change 2115 and 1515 to 0230, 1515, 2115.
Add: 2200 Surface prognosis 72 hrs.

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3-0350 Honolulu, Hawaii KVM
Delete footnotes--broadcasts are omnidirectional.

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4-0010 Boston, Mass., U.S.A.
Change times and frequencies to read:

5320, 8502 (0018)	Ice Bulletins
8502, 12750 (1218)	Ice Bulletins

Marine Observations Program

J.W. Nickerson
National Weather Service, NOAA
Silver Spring, Md.

NEW SYNOPTIC CODE

As you know, the synoptic code format is going to change on January 1, 1982. We know how traumatic it can be. "I've just learned the old one, why are they changing it?" Well, the changes are largely in format, not in observing code tables or procedures.

There are a lot of pluses to this code change. For one thing, we get rid of all the bad features of several code formats that have grown sort of like weeds over the years. These are:

FM 11-V Synoptic observation from land stations;

FM 14-V Synoptic observation from automatic land stations;

FM 21-V Synoptic observation from sea stations;

FM 22-V Abbreviated synoptic observation from a ship;

FM 23-V SHRED-reduced synoptic observation from a sea station; and

FM 24-V Synoptic observation from an automatic sea station.

In place of these we will have the new:

FM 12-VII Land station synoptic code; and
FM 13-VII Ship station synoptic code.

One of the things you will notice in the new synoptic code is that, except for a small lead section, all of the groups have number indicators. If a group doesn't apply, it can be left out without disrupting the rest of the observation record and message.

OBSERVER'S MANUAL

After listening to your comments on the Weather Service Observing Handbook No. 1 (WSOH-1), we decided that it was time for rewriting. When this code change came along, we used this as our reason for a complete overhaul, starting with the cover. It will be a ring-binder notebook, so we can keep it up to date and add new sections as appropriate. It will also stand neatly in the bookcase. This manual will be written for the use of the observer.

Chapter One will explain how the ship observer fits into the whole observation (analysis/forecast/warning) picture. It will relate the ship observations to other observation systems--buoys, satellites, and automatic stations.

Chapter Two is the core chapter. Each group of the weather observation will be treated in a separate section. In each divider-separated section each observation element of the group first will be defined, and then the procedures of how to observe it will be briefly explained. Any tables required for the observation will be in the section where they are used. The data of the tables are also arranged in priority order. More lengthy explanations, land station counterpart codes, and how the observation element fits into various weather phenomena will be in the later chapters of the manual.

We think that the improved format of Chapter Two will eliminate the requirement for the ship code card. We are also planning to keep the observation record (log) the same size so that it will fit in the space already allotted aboard ship. As always, we welcome your comments.

MIAMI PORT METEOROLOGICAL OFFICER

Walter Sitarz, the Port Meteorological Officer at Miami, Fla., is taking a position in Saudi Arabia. Walt has done a lot for the Marine Observations Program, covering the merchant marine service and training requirements in the growing port of Miami, the southeastern United States, and the Caribbean. We will all miss Walt and wish him success in his new job.

The PMO position in Miami is particularly important as it has added liaison responsibilities with the National Hurricane Center. Pete Connors, who was recently assigned to Jacksonville, Fla., from Beaumont, Tex., will be moving to Miami. Pete has long experience as a PMO.

Connors, a seagoing veteran of 20-yr service with the Weather Service and the Environmental Research Laboratories, was previously assigned to the Sea-Air Interaction Laboratory at NOAA's Atlantic Oceanographic and Meteorological Laboratories in Miami. He has participated in meteorological expeditions that have taken him from the Antarctic aboard the ELTANIN to the Northwest Territories of Canada. He served aboard ocean station vessels as a member of the Atlantic Weather Project. He has sailed aboard NOAA's research vessels OCEANOGRAPHER, RESEARCHER, and VIRGINIA KEY and supported meteorological and oceanographic activities in such international field experiments as ATEX, BOMEX, GATE, FGGE, and the Indian Ocean Expedition.

HURRICANE SEASON LETTER

Hurricane season letters will be mailed to all ship masters very soon. The text and instructions are in Hints to the Observer.

Last year some ship's observers misunderstood about including the remarks section in the radio message. Send the whole thing. Preface the message with STORM to be sure it is given priority attention. If the storm or hurricane has been named, use the name to start your remarks. The message should be sent with the highest priority. Try the Coast Guard radio stations first because there are automatic subroutings of the observation message. However, if the message is not accepted without delay, send it through a commercial station listed in the manual Radio Stations Accepting Ships Weather and Oceanographic Messages (NOAA S/T 78-410).

COMMUNICATIONS POLICY

There is a communications policy statement being developed. In general, it will say, "use Coast Guard or government radio stations first when sending messages." Government stations relay weather messages without charge to the National Weather Service. All others cost money, and the allotted budget has been nearly depleted from overuse of commercial facilities. Commercial stations are needed for backup for important messages, such as the hurricane message, but overuse could kill the whole program.

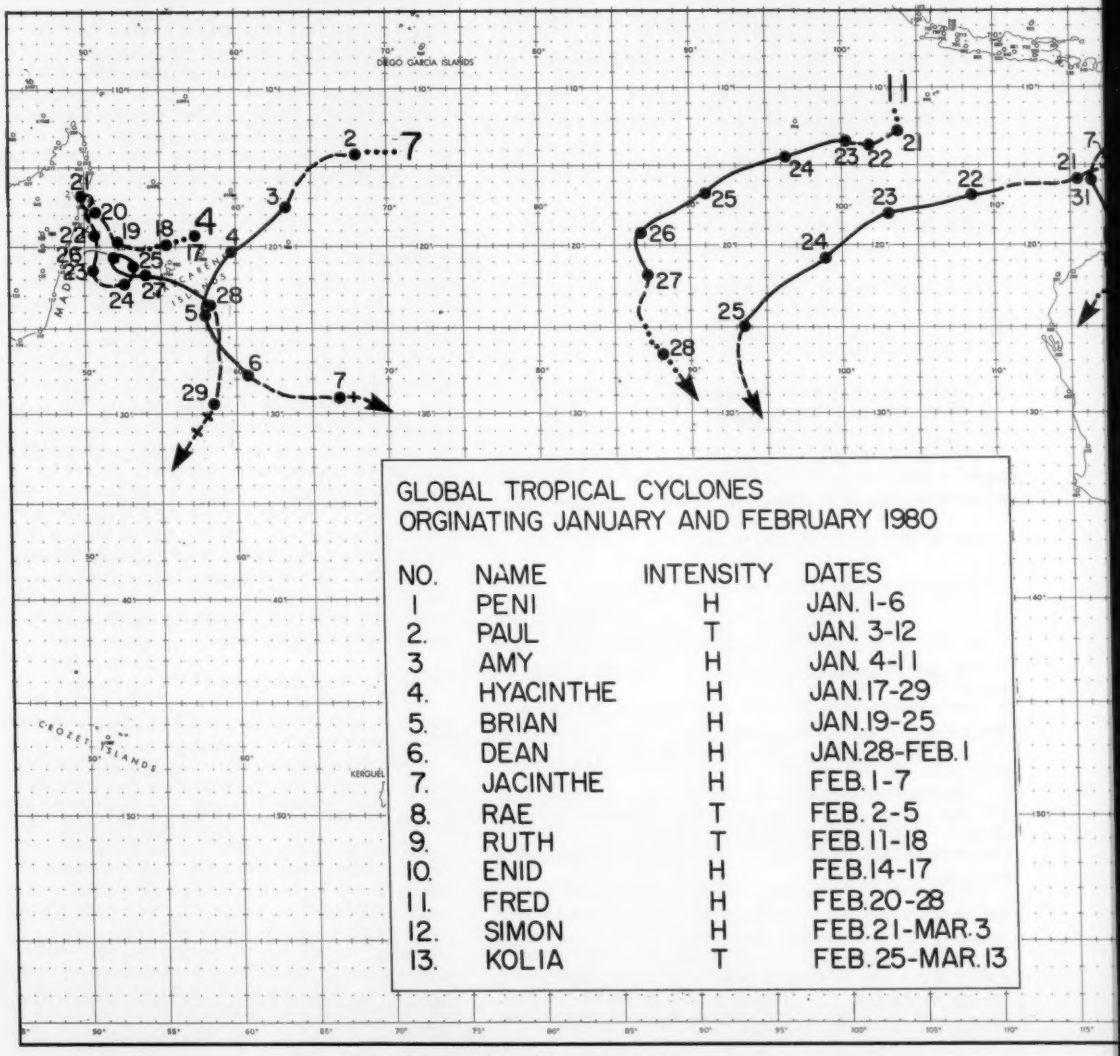
The complete policy statement will appear in the next issue.

Hurricane Alley

Dick DeAngelis
Environmental Data and Information Service, NOAA
Washington, D.C.

GLOBAL TROPICAL CYCLONES
JANUARY AND FEBRUARY 1980

Global activity was close to normal during this period. Thirteen tropical cyclones (tropical storms and hurricanes) roamed the world's tropical oceans, all south of the Equator (fig. 26). Nine of the storms rea-



GLOBAL TROPICAL CYCLONES
ORGINATING JANUARY AND FEBRUARY 1980

NO.	NAME	INTENSITY	DATES
1	PENI	H	JAN. 1-6
2.	PAUL	T	JAN. 3-12
3	AMY	H	JAN. 4-11
4.	HYACINTHE	H	JAN.17-29
5.	BRIAN	H	JAN.19-25
6.	DEAN	H	JAN.28-FEB.1
7.	JACINTHE	H	FEB.1-7
8.	RAE	T	FEB. 2-5
9.	RUTH	T	FEB.11-18
10.	ENID	H	FEB.14-17
11.	FRED	H	FEB.20-28
12.	SIMON	H	FEB.21-MAR.3
13.	KOLIA	T	FEB.25-MAR.13

Figure 26.--Global tracks of tropical cyclones, January and February, 1980.

ched hurricane intensity. On the average you can expect 13 tropical, including 6 hurricanes.

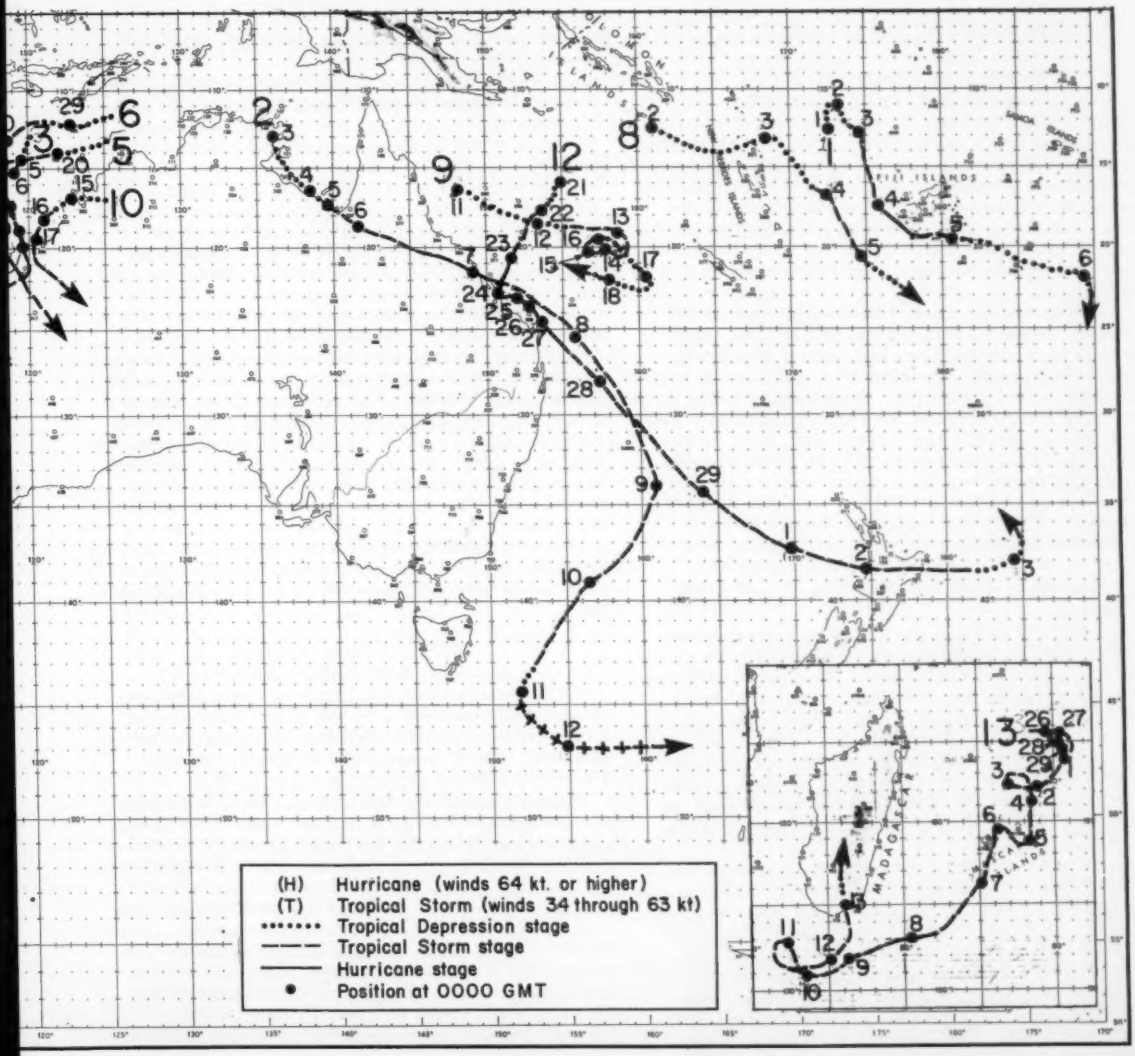
The tropical cyclone tracks represent a compilation of the information received from Reunion, Australia, New Zealand, New Hebrides, and New Caledonia; our thanks to these dedicated meteorological services. A brief summary of the tropical cyclones appears in table 13.

Table 13.—Global tropical cyclone summary, January and February 1960

No.	Name	Peak intensity	Est. max. wind (kn)	Est. min. sea-level pressure (mb)	Basin	Dates
1.	Peni	H	65	982	Aust.-S. Pacific	Jan. 1-6
2.	Paul	T	60	990	Aust.-S. Pacific	Jan. 3-12
3.	Amy	H	100	934	Aust.-S. Pacific	Jan. 4-11
4.	Hyacinthe	H	70	973	S. Indian	Jan. 17-29
5.	Brian	H	90	964	Aust.-S. Pacific	Jan. 19-25
6.	Dean	H	85	964	Aust.-S. Pacific	Jan. 25-Feb. 1
7.	Jacinthe	H	100	954	S. Indian	Feb. 1-7
8.	Rae	T	40	992	Aust.-S. Pacific	Feb. 2-5
9.	Ruth	T	55	985	Aust.-S. Pacific	Feb. 11-16
10.	Enid	H	90	986	Aust.-S. Pacific	Feb. 14-17
11.	Fred	H	95	954	Aust.-S. Pacific	Feb. 20-28
12.	Simon	H	100	950	Aust.-S. Pacific	Feb. 21-Mar. 3
13.	Kolia	T	60	985	S. Indian	Feb. 25-Mar. 13

NORTH ATLANTIC OFF EARLY

Not since 1932 has the North Atlantic tropical cyclone season gotten off to such an early start. Tropical storm Arlene developed in the northwestern Caribbean on May 7 this year. While May storms are not rare, June is usually considered the beginning of the season. This early start, combined with last season's late finish (November 27), makes for one of the shortest off seasons in memory.



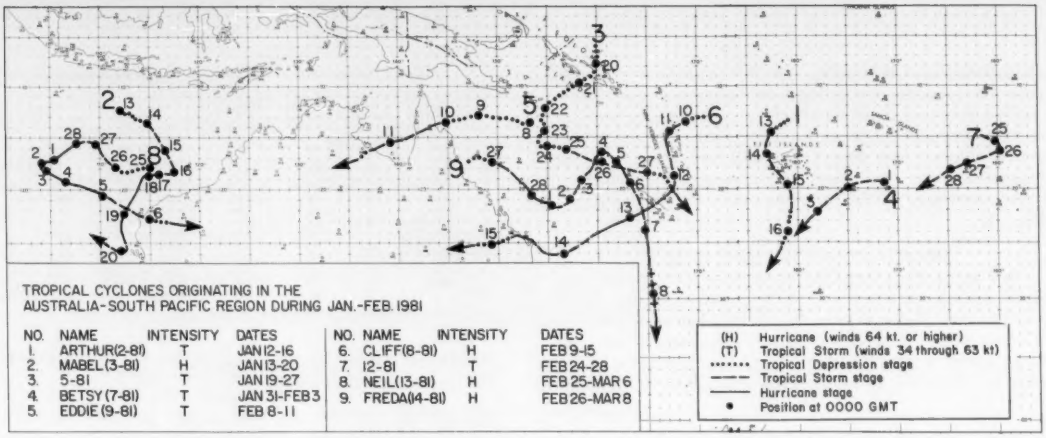

TROPICAL CYCLONES ORIGINATING IN THE
AUSTRALIA-SOUTH PACIFIC REGION DURING JAN.-FEB. 1981
NO. NAME INTENSITY DATES
1. ARTHUR(2-81) T JAN 12-16
2. MABEL(3-81) H JAN 13-20
3. 5-81 T JAN 19-27
4. BETSY(7-81) T JAN 31-FEB 3
5. EDDIE(9-81) T FEB 8-11
NO. NAME INTENSITY DATES
6. CLIFF(8-81) H FEB 9-15
7. 12-81 T FEB 24-28
8. NEIL(13-81) H FEB 25-MAR 6
9. FREDA(14-81) H FEB 26-MAR 8
(H) Hurricane (winds 64 kt. or higher)
(T) Tropical Storm (winds 34 through 63 kt)
Tropical Depression stage
Tropical Storm stage
Hurricane stage
Position at 0000 GMT

Figure 27.--Tracks of Australia-South Pacific tropical cyclones, January and February, 1981.

AUSTRALIA - SOUTH PACIFIC
JANUARY AND FEBRUARY 1981

Nine tropical cyclones developed during this period; four reached hurricane intensity. This is slightly above the average of seven and three. Activity was widespread. Two cyclones affected the west coast of Australia, four roamed the Coral Sea, while three developed in the South Pacific (fig. 27). It is also probable that another storm named Daman developed in the South Pacific in late February, but we have little information on this at present.

Tropical storm Arthur, whose winds approached hurricane strength, battered the Fiji Islands. Most severely hit were Viti Levu and several smaller islands. Crop damage was extensive, and several hundred houses were destroyed. It also appears that three fishermen were lost when their launch capsized. Two local cruise vessels and a foreign yacht were driven aground at Nadi. Wind gusts of 73 kn were reported. During this period hurricane Mabel was bearing down on the iron ore-producing Pilbara region of Western Australia. This threat forced the closing of Port Headland to inbound ore carriers on the 14th. Mabel skirted the coast and her 95-kn winds remained at sea. Two other minor tropical storms came to life in January.

In February tropical storm Eddie, a short-lived tropical storm, moved across the Cape York Peninsula and the Gulf of Carpentaria. Hurricane Cliff developed among the New Hebrides Islands and struck New Caledonia on the 12th. Houses and coffee and coconut plantations suffered heavily. Most of the island's roads were impassable, telephone lines were cut, and air traffic was disrupted by torrential rains and winds up to 80 kn. Cliff then tracked through the Coral Sea, weakened, and finally came ashore north of Brisbane.

Hurricanes Neil and Freda developed within a day of each other at nearly the same latitude. Neil was spawned off Western Australia, while Freda came to life along the Great Barrier Reef off Queensland. At this time both were moving away from the continent, Freda on a well-behaved southeasterly course and Neil on an erratic west-northwestward track. Neil was prevented from a southward movement by a weak subtropical ridge. Both received good upper level outflow and intensified to hurricane strength before the month was finished. The key to their future movement was a long-wave trough over Australia. The forecasted eastward shift of this feature would allow the ridge to push east and Neil to move southward. Freda, who had weakened and drifted erratically toward the Equator, would also be forced to a more normal southerly track. By the 3d Neil began to drift slowly southeastward toward cooler coastal water and increased upper level shear. It wasn't until the 5th that moderate middle to upper level northwesterly steering currents became established, and a weakening Neil began to accelerate towards the Australian coast. Meanwhile, Freda was reintensifying under a well-defined upper level anticyclone. A trough at 500 mb was moving eastward and deepening. Its steering ability was demonstrated as Freda turned sharply southward on the 4th. This path took Freda into New Caledonia, causing heavy crop damage and isolating many villages; this was about 3 weeks after being devastated by Cliff. Neil in the meantime had continued his progress toward the coast and banged ashore on the 5th just south of Onslow; his winds were estimated at 50 kn.

Freda's maximum winds were estimated at 70 kn on the 28th. Neil's maximum winds occurred on March 1, when winds were estimated at 100 kn with gusts to 125 kn.

SOUTH INDIAN OCEAN
JANUARY AND FEBRUARY 1981

Of the four South Indian Ocean cyclones, only one reached hurricane intensity (fig. 28). Activity was slightly below normal in this basin, mainly due to a relatively slow February; this is usually the most active month of the year.

Things started off with a bang, when hurricane Florine appeared in early January. She reached hurricane intensity on the 6th after passing Cargados Carajos Shoals, where a 52-kn wind was reported along with a 3-hr 26.8-mb pressure fall. A short time later gusts of 80 kn were reported by the Shoals station. By the 7th, as Florine approached Mauritius, winds near her center were estimated at 100 kn with gusts to 125 kn. No significant damage occurred on Mauritius, but heavy swells and rough weather kept Port Louis closed for a couple of days. Florine brushed Reunion and remained at hurricane strength through the 8th.

Toward the end of January Helyette developed south

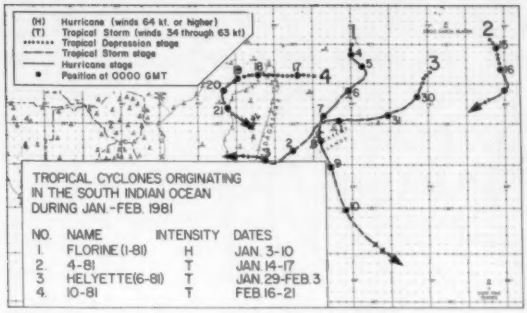

(H) Hurricane (winds 64 kt. or higher)
(T) Tropical Storm (winds 34 through 63 kt)
Tropical Depression stage
Tropical Storm stage
Hurricane stage
Position at 0000 GMT
TROPICAL CYCLONES ORIGINATING
IN THE SOUTH INDIAN OCEAN
DURING JAN.-FEB. 1981
NO. NAME INTENSITY DATES
1. FLORINE (1-81) H JAN. 3-10
2. 4-81 T JAN. 14-17
3. HELYETTE(6-81) T JAN. 29-FEB. 3
4. 10-81 T FEB. 16-21

Figure 28.--Tracks of South Indian Ocean tropical cyclones, January and February, 1981.

of the Diego Garcia Islands. She also passed close to Mauritius and Reunion. It appears that her maximum winds never climbed above 40 kn. Synoptic data from Port Louis indicated the storm passed near the station just prior to 0300 on February 1. Another tropical storm developed around mid-January near the 80th meridian, while a February storm moved across Madagascar.

TROPICAL CYCLONE WATCH - 1981

The tropical cyclones that have developed through May 1981 appear in table 14. This list is preliminary.

Table 14.--World tropical cyclone watch, 1981

South Indian Ocean				Australia-South Pacific			
Florine	01-81	H	Jan.	Arthur	02-81	T	Jan.
	04-81	T	Jan.	Mabel	03-81	H	Jan.
Helyette	06-81	T	Jan.		05-81	H	Jan.
	10-81	T	Feb.	Betsy	07-81	T	Jan.
Johanne	16-81	H	March	Cliff	08-81	H	Jan.
Olga	22-81	H	April	Eddie	09-81	T	Feb.
Lisa	23-81	T	April	Daman	11-81	T	Feb.
					12-81	T	Feb.
Western North Pacific				Neil	13-81	H	Feb.
Freda		H	March	Freda	14-81	H	Feb.
Gerald		T	April		15-81	T	March
Holly	TC-3	T	April	Max	17-81	H	March
					18-81	T	March
North Atlantic				Fran	19-81	T	March
Arlene		T	May		20-81	T	March
				Klara	21-81	T	April

On the Editor's Desk

ALASKA RADIOFACSIMILE SYSTEM

On March 11, 1981, the U.S. Coast Guard and the National Weather Service (NWS) began radiofacsimile broadcasts from the USCG Station Kodiak. Under a joint agreement, the Coast Guard will provide radio transmitting facilities and the NWS will prepare meteorological and oceanographic charts for transmission to mariners at sea. The National Earth Satellite Service (NESS) is also contributing by providing sea-surface temperature and sea-ice analyses charts. In addition, the NASA Jet Propulsion Laboratory (JPL) will be providing two experimental Fisheries Aids charts which will include data of use to fishermen operating in Alaska waters. The exact content of the latter charts has not yet been determined. Initially, two surface weather analyses and one surface weather prognosis will be provided. Other charts will be phased in as shown in the facsimile schedule on page 93 of the March-April 1981 Mariners Weather Log (Vol. 25, No. 2).

Transmissions will be made on frequencies 4298 and 8459 kHz. The transmission schedule will be fully operational by May 25, 1981. Following is a description of each product to be provided.

1. Surface Weather Analysis--A standard analysis transmitted four times daily at 0400, 1000, 1600, and 2200 GMT. The chart will include wind barbs at selected data points, major highs and lows including expected movement, weather fronts, and isobars (8-mb spacing). The chart will cover the Gulf of Alaska, concentrating on the area north of 50°N latitude.

2. Surface Weather Prognosis--A 24-hr weather prognosis showing expected positions of major weather systems, fronts, and areas of winds greater than 20 kn. The area of interest will be the Gulf of Alaska north of 50°N latitude. Charts will be transmitted twice daily at 1010 and 2220 GMT. Figure 29 shows a sample of this product.

Table 15.--NWS coastal marine forecast, Alaska waters

Forecast for 1200 GMT October 20, 1980 - Issued 0200 GMT October 20, 1980

Area	Winds (kn)	Seas (ft)	Weather	Warnings	Icing
1	SE 25	2 - 5	RAIN	NONE	NONE
2A	SE 30	4 - 8	RAIN	NONE	NONE
2B	SE 30	4 - 8	CLOUDY	NONE	NONE
3	SE 40	5 - 10	RAIN	SMALL CRAFT	MODERATE
4	SE 60	12 - 18	SNOW	STORM	HEAVY
5	SE 20	2 - 4	CLOUDY	NONE	NONE
6A	SE 20	2 - 4	CLOUDY	NONE	NONE
6B	SE 25	2 - 5	CLOUDY	NONE	NONE
7	SE 30	2 - 5	PARTLY CLOUDY	NONE	NONE
8	SE 25	2 - 5	PARTLY CLOUDY	NONE	NONE
9	SE 30	4 - 8	CLOUDY	NONE	NONE
10	SE 20	2 - 4	DRIZZLE	NONE	NONE
11	SE 20	2 - 4	RAIN	NONE	NONE
12	SE 25	2 - 5	RAIN	NONE	NONE
13	SE 25	2 - 5	CLEAR	NONE	NONE
14	SE 25	2 - 5	CLEAR	NONE	NONE

Next forecast scheduled for transmission: October 20, 1980 - 1630 GMT

3. Five-Day Marine Weather Outlook--A verbal description of the expected general track of major weather systems in the North Pacific during the 5 days following issuance of the product. General areas of expected strong winds are also described and a confidence factor regarding the expected accuracy of the product is included. The concept of the product is to provide the mariners with a hard copy of the long-range forecast. The forecast is issued once daily and transmitted over radiofax twice daily at 1020 and 2210 GMT.

4. High Seas Wave Forecast--A graphical forecast product depicting the expected wave heights in the Gulf of Alaska beyond 100 mi of the coastline. The wave heights will be depicted as isopleths and the forecast wave heights will be for approximately 12 to 18 hr from the time of issuance of the product. This product will be issued and transmitted once daily. The exact transmission time will be announced to mariners at a later date.

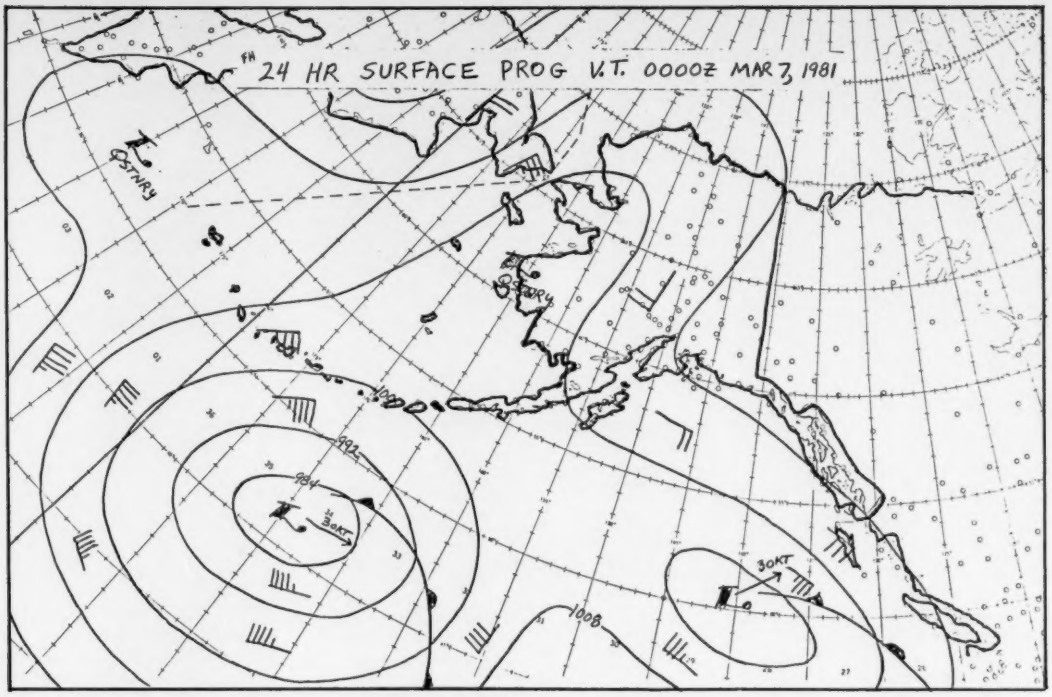


Figure 29.--An example of the Surface Weather Prognosis.

5. Marine Forecast Summary--An alphanumeric product summarizing the coastal marine forecasts for all coastal areas in Alaska in a tabular form. Two tables will be issued: one a 12-hr forecast and one a 24-hr forecast. Each table will be transmitted twice daily to coincide with issuance of the marine forecasts. The 12-hr forecast summary will be transmitted at 0410 and 1610 GMT daily, and the 24-hr forecast will be transmitted at 0420 and 1620 GMT. Table 15 is a sample of this product.

6. Sea-Surface Temperature/Ice Analysis (Bering Sea--A graphic analysis chart of the sea-surface temperatures and sea ice covering the area from the Aleutian Chain to the Bering Strait and from the west coast of Alaska to 180°W. The product is prepared jointly by NESS and NWS and will be broadcast four times a week (2250 GMT Wednesday, Friday and 0430 GMT Tuesday, Thursday). The chart is intended as an aid to the marine community, particularly commercial fishermen and mariners operating in areas affected by sea ice.

7. Sea-Surface Temperature (Gulf of Alaska)--Two charts depicting sea-surface temperature. One chart will cover the area from 52°N latitude to Yakataga and offshore to 142°W. The second chart will include the Gulf of Alaska marine area from Yakataga to the Semidi Islands. Temperatures will be given in Celsius and a conversion table to Fahrenheit will be included. The charts will be transmitted back-to-back beginning at 2350 GMT on Wednesdays and Fridays and 0440 GMT on Thursdays and Saturdays.

8. Sea-Ice Forecast--A five-day graphical forecast of the expected ice movement in the Bering and Chukchi Seas. Also included will be areas of new ice formation. This product will be transmitted twice weekly on Monday and Thursday at 2230 GMT.

9. Experimental Fisheries Aids Charts--Two charts depicting various parameters of interest to fishermen, prepared by NASA JPL. The exact content of the charts has not yet been determined. The charts will be transmitted beginning at 2300 GMT daily.

AVERAGE NUMBER OF U.S. SHIP WEATHER REPORTS

Robert Quayle of the National Climatic Center in Asheville, N.C., made a quick study of the average number of weather reports received by mail and by

Table 16.--Average number of weather reports per day from U.S. ships

Month/No. days	Radio		Mail	
	Total	Avg.	Total	Avg.
Sept.-Oct. 1978 (61)	17,635	289	52,479	860
Nov.-Dec. 1978 (61)	24,040	394	49,437	810
Jan.-Feb. 1979 (59)	21,991	373	47,933	812
March-April 1979 (61)	21,659	355	51,810	849
May-June 1979 (61)	22,596	370	52,218	856
July-Aug. 1979 (62)	24,868	401	54,167	874
Sept.-Oct. 1979 (61)	24,575	403	51,834	850
Nov.-Dec. 1979 (61)	25,128	412	51,278	841
Jan.-Feb. 1980 (60)	23,580	393	49,095	818
March-April 1980 (61)	24,511	402	48,974	803
May-June 1980 (61)	24,434	401	48,632	797
July-Aug. 1980 (62)	23,624	381	53,034	855

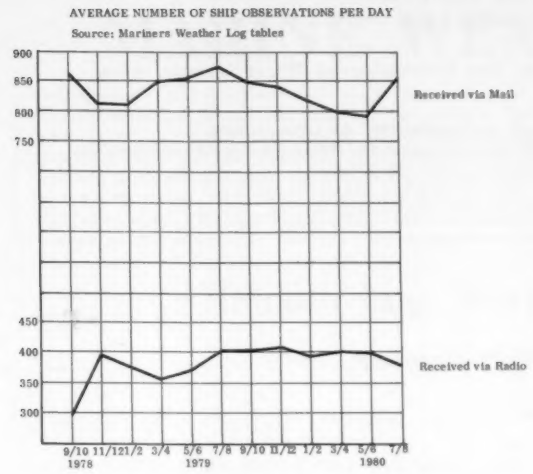


Figure 30.--A graph of the average number of weather observations received daily by radio and mail.

radio each day from U.S. Cooperative Ships. He used the bimonthly figures published in each issue of the Mariners Weather Log. Table 16 shows the total bimonthly and average daily figures for each 2-mo period. Figure 30 is a graph of the table.

KENNEDY, GREAT LAKES PMO GETS AWARD

The Inter-Lake Yachting Association presented William E. Kennedy, the NWS Port Meteorological Officer, Cleveland, with a plaque for his work in promoting safe boating on Lake Erie. Bill has been in charge of the marine weather program in Cleveland since 1953 and has worked closely with the marine community to promote safe boating by giving lectures and teaching boaters about weather.

SEA STATE FORECASTING

A manual entitled An Introduction to Sea State Forecasting has been published by the National Weather Service of NOAA. It is authored by Captain Graham P. Britton, Royal Navy (Retired), and edited by Commander Kenneth E. Lilly, Jr., NOAA.

The manual would be of interest to many mariners and can be obtained from Government Printing Office bookstores or from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

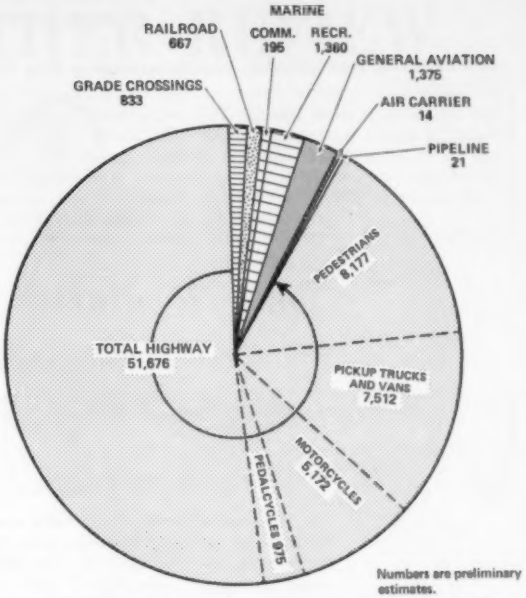


Figure 31.--Pie chart of transportation-related fatalities.

SAFETY BOARD RELEASES 1980 STATISTICS

The annual transportation fatality toll in the United States remained essentially unchanged in 1980, according to preliminary statistics released by the National Transportation Safety Board (fig. 31).

Highway fatalities also were relatively stable, increasing only 1 percent over 1979.

There were 56,141 fatalities in all transportation modes last year, an increase of 3 tenths of 1 percent over the 55,953 in 1979. Highway fatalities totaled 51,676 as compared with 51,093 in 1979.

Among the various modes, there was substantial change only in aviation and pipeline fatality tolls. With air carrier fatalities dropping from 355 in 1979 to 14 in 1980, and commuters down from 65 to 23, total aviation fatalities were down 20 percent at 1,389. Pipeline fatalities totaled 21, down 50 percent from 42 in 1979.

Railroad fatalities were up 9.7 percent, reflecting increases from 62 to 83 in rail rapid transit, and 540 to 580 in intercity crew, pedestrian, and other fatalities.

Commercial marine fatalities were up 5 to 195 in 1980 and recreational fatalities were 1,360 from 1,400 in 1979. The totals were 1,555 for 1980 and 1,590 in 1979.

THE MARINERS WEATHER LOG WELCOMES ARTICLES AND LETTERS FROM MARINERS RELATING TO METEOROLOGY AND OCEANOGRAPHY, INCLUDING THEIR EFFECTS ON SHIP OPERATIONS.

LETTERS TO THE EDITOR

VOICE REPORTING SUMMARIES

The following memorandum was forwarded by Don Olson, Port Meteorological Officer, Seattle, Wash.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE
1700 Westlake Avenue North
Seattle, Washington 98109

Date March 26, 1981 Reply to Attn. of:

To ED&IS, D762, Editor Mariner's Weather Log

From Port Meteorological Officer, Seattle, Wa.

Subject Voice reporting Summaries

The following summary of tugs and ships that have sent plain language reports to WBH-29, Kodiak, Ak. Peggy Dyson radio for February 1981. These reports are used by the WSFO's in Alaska and the Seattle Ocean Service Unit. These ships' Captains and Mates do an excellent job in passing this info on to Peggy on a daily basis when at sea. It is very unfortunate that this information is not listed in the Mariner's Weather Log.

I hope this could be published as a "Thank You" to many tug Captains and fishing boat Captains that forward these excellent observations through Peggy Dyson's radio station.

These are not complete totals for these ships as some of their obs are sent via Coast Guard communication channels. Of the 434 observations sent thru WBH-29,284 obs were from the following vessels.

Foss Tugs		Crowley Maritime Corp.		Alaska Shipping Co.	
Margaret Foss	38	Mars	47	Snowbird	32
Justine Foss	29	Invader	15	Aleut Packer	26
Leslie Foss	10	Gladiator	27		
Alaska Husky	26	Ranger	2		
		Guardsman	21		
		Adventurer	9		

The following is a summary of voice reports sent from ships, tugs and fishing boats to WBH-29 for March 1981.

Foss Tugs		Crowley Maritime Corp		Alaska Shipping	
Justine Foss	40	Ranger	13	Snowbird	34
Leslie Foss	16	Guardsman	15	Aleut Packer	12
Alaska Husky	8	Adventurer	11		
		Marty De Felice	7		
Western Pioneer Lines		Gladiator	13	Trans-Pac Idustries	
Mogul	8	Invader	18		
Dolphin	2	Crusader	1	Trans-Pac	22

U.S. Tankers		Fishing Boats	
SS Sansinena II	13	Peggy Jo	7
SS Arco Alaska	2	Katrina EM	43
		Bountiful	13
		Windrunner	4
		Dawn	6
		Bering	7

MARINE WEATHER REVIEW

The Smooth Log (complete with cyclone tracks, climatological data from U.S. Ocean Buoys, and gale and wave tables) is a definitive report on average monthly weather systems, the primary storms which affected marine areas, and late-reported ship casualties for 2 mo. The Rough Log is a preliminary account of the weather for 2 more recent months, prepared as soon as the necessary meteorological analyses and other data become available. For both Smooth and Rough Logs, storms are discussed during the month in which they first developed. Unless stated otherwise, all winds are sustained winds and not wind gusts.

Smooth Log, North Atlantic Weather

November and December 1980

SMOOTH LOG, NOVEMBER 1980--The extratropical traffic across the North Atlantic was light this month. Several of the storms were very large. The primary storm track was across the Great Lakes; it was joined by a secondary track east of Nova Scotia off the East Coast. The track then continued to the Faeroe Islands. There was a cluster of storm paths over Canada north of latitude 55°N, but they remained over that area with one exception. Another primary track originated west of Portugal and extended eastward across the northern Mediterranean Sea. These paths were quite different from climatology.

The major sea-level pressure feature was the displaced 1002-mb Icelandic Low. It was centered near 47°N, 42°W, about 1,000 mi southwest of its usual position. There was a 1003-mb Low center north of the White Sea and a 1008-mb center over the northeastern edge of Hudson Bay. The Azores High was 1021 mb near 29°N, 23°W, about 500 mi southeast of its usual location (fig. 32).

The displacement of the Icelandic Low resulted in a large negative anomaly of 14 mb centered near 43°N, 40°W. A minus 11 mb anomaly was located over northern U.S.S.R. The mean pressure over Iceland was 10 mb higher than normal.

The flow at 700 mb was zonal from the eastern United States to about longitude 40°W, where it turned northeastward in the higher latitudes in response to a ridge off the European coast. South of latitude 40°N, it remained zonal with slight waving across the Mediterranean.

Jeanne and Karl were rare November hurricanes. Since 1930, there have been only seven other hurricanes during this month and never more than one.

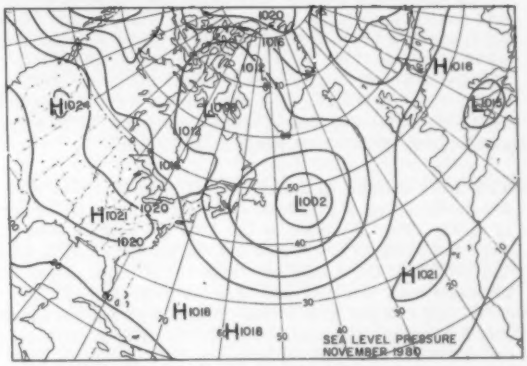


Figure 32.--Mean sea-level pressure.

Extratropical Cyclones--The first significant storm of the month was short-lived. A report by the RODIN at 1200 on the 3d helped analyze a new LOW in a sharpening trough. The LOW raced northeastward while deepening and was near 51°N, 33°W, by 1200 on the 4th. A large HIGH blocked further eastward movement and tightened the gradient in the eastern circulation. The CARCHESTER (49°N, 24°W) had 30-ft swells and the MIROSLAWIEC (42°N, 24°W) had 54-kn winds. Ships on the west side had winds in the 40-kn category. The LOW was north of OWS Charlie on the 5th, leaving 47-kn winds and 21-ft seas behind. The FRANK SCHROEDER (42°N, 36°W) was sailing into 30-ft waves all day. Many ships had waves over 20 ft. The storm was gone on the 6th.

This storm originated as a frontal wave on the 7th. A ship at the front found confused, 20-ft waves. The Greek ore carrier DAPO ALECOS sustained weather damage and had to be put aground at Mooring Cove, Newfoundland. By 1200 on the 8th the storm had developed a good circulation around the center. The ERLANGEN EXPRESS (42°N, 34°W), 400 mi southeast of the center, had 58-kn winds with 33-ft waves. The CARCHESTER, 500 mi south of the center, had 60-kn winds with 49-ft waves on her starboard bow. The SEA-LAND PACER suffered only 50 kn and 20-ft waves. This luck did not hold as the waves were 30 ft on the 9th. The storm was weakening on the 10th, but a ship had 52-kn winds immediately west of the center.

On the 12th the storm moved along the north coast of Spain. A ship off Portugal had 47-kn winds. The LOW moved across Sardegna on the 13th. There were some gales south of France, but they dissipated on the 14th.

A storm was moving across the Great Lakes on the 9th. The J.A.W. IGLEHART had 44-kn winds on Lake Huron. By the 10th a wave had formed on the front over Long Island. By 0000 on the 11th it had absorbed the original storm and vastly expanded with accompanying gales. At 1200 on the 11th the storm was 976 mb near 43°N, 52°W, with two centers. Ships were reporting 40- to 50-kn

winds with waves up to 25 ft in the southwest quadrant. The SEA-LAND GALLOWAY was near the occlusion east of the LOW with southerly 40-kn winds and 33-ft swell waves. On the 12th the MIROSLAWIEC (35°N, 60°W) again had over 50-kn winds and 33-ft waves. On the 1200 scan there were many 40- to 55-kn wind reports with high seas. The highest was 39 ft. The KING WILLIAM among others was having a bad time on the 13th with winds near 60 kn and waves up to 33 ft. The BAKKAFOSS, north of the center at 57°N, 45°W, battled 60-kn northeasterly winds, but as usual the Icelandic ship did not report waves. By the 14th another center formed east of the main 972-mb center. The storm was weakening with mostly gales reported. The new center brought gales to the North Sea. The AMERICAN ACE was about 600 mi southwest of the original center, on the 15th, with 55-kn winds.

On the 16th a frontal wave came out of the south and passed east of the main center. The VIKING BULKER south of the two centers had 45-kn winds and 25-ft waves. On the 17th the two LOWs came under the influence of zonal flow and raced off to the east. OWS Romeo had 30-ft waves. As the storm moved over Scotland, the North Sea was subjected to gales. The storm stalled over the Gulf of Finland on the 19th.

This LOW formed in the wake of the storm above with the combination of a frontal wave and a weak LOW early on the 17th. By 0000 on the 18th the central pressure had plunged to 970 mb near 48°N, 44°W. The SEA-LAND PRODUCER, 500 mi south of the LOW, found 55-kn winds with 36-ft waves. The APOLLONIA (47°N, 48°W) had 983 mb with 55-kn winds. By 1200 the chart was saturated with winds over 40 kn. The highest on the radio printout was 68 kn near 40°N, 30°W, by the MANISTEE. The German ship DILZ had 39-ft seas. The high winds and waves continued as the central pressure dropped to 960-mb at 1800 on the 18th. On the 19th the MAIRANGI BAY found 49-ft swells near 41°N, 36°W.

Another strong storm was following this one, which was weakening as it separated from the outflow of the primary upper air LOW. There were again high winds around the United Kingdom as the storm sped eastward.

Cape Hatteras makes another contribution. This storm traveled along the East Coast on the 18th and deepened gradually. Gales had already started by 0000 on the 19th. By 1200 the storm was 968 mb less than 100 mi northeast of Sable Island (fig. 33). The GREEN ISLAND had 50-kn winds very near the cold front 600 mi south of the center. At 1200 on the 20th the storm was 956 mb near 49°N, 47°W. SEDCO measured 58-kn winds,

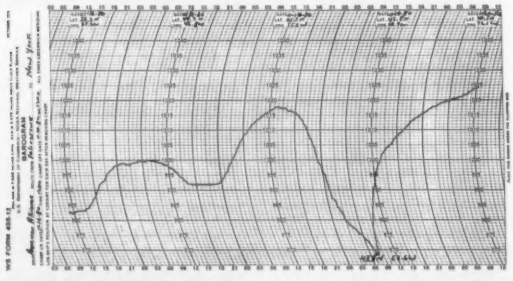


Figure 33.--The barogram from the AMERICAN ALLIANCE.

and the ERLANGEN EXPRESS (50°N, 49°W) was 17 mb west of the center with 60-kn winds and 39-ft waves. There were several reports of winds over 50 kn and waves over 30 ft. The ASPEN CARRIER (5,352 tons) radioed that she encountered heavy weather in latitude 41.9°N, 46°W. Derricks and hatches were damaged and a truck was lost overboard with others damaged.

This storm combined with the circulation of the prior storm covered most of the ocean north of latitude 35°N with severe weather. On the 21st the AMERICAN ACCORD and SEA-LAND PRODUCER both had waves over 30 ft. Strong winds and high waves continued into the 22d when the storm started relaxing and was only a trough by the 23d. Another had already come off the East Coast.

An inverted trough off Florida gave birth to this LOW. The storm was 984 mb west of Cape Cod at 1200 on the 22d. The VC96 at 43°N, 65°W, had easterly 64-kn winds. Others to the south had 50 kn. The SEA-LAND PRODUCER had passed very near the center of this storm and at 1800 was in the northwest circulation with 78-kn winds and 65-ft waves. Twenty-four hours later at 1200 on the 23d the LOW was 968 mb near 39°N, 55°W. A German ship near 38°N, 63°W, reported 49-ft swells. The DEL VALLE very near the same location reported 69-kn northerly winds and 39-ft waves.

This storm was traveling slightly south of east, not the usual path. Winds of 50 kn and waves higher than 25 ft continued. The MONTFORT (30°N, 45°W) had 66-kn winds with 30-ft swells and the AMERICAN LEGEND (37°N, 60°W) suffered with 45-kn winds driving 26-ft seas and 33-ft swells. On the 25th the higher winds were running from 40 to 55 kn and the waves to over 38 ft. The 16,984-ton KAPETAN GEORGIS (31.5°N, 56.7°W) sustained dangerous weather damage by giant waves.

Now for a significant reverse of the usual. Many tropical storms turn extratropical as they travel northward. This extratropical storm became tropical and was labeled hurricane Karl at 1600 on the 25th. From the weather reports it appeared that many ships had rerouted away from the storm by this time. On the 26th the reports were in the gale range with waves of about 20 ft. The SEA-LAND CONSUMER (40°N, 33°W) had 30-ft swells from the southeast. The storm started to fall apart on the 27th and had dissipated by the 28th, as yet another strong extratropical storm moved southeastward.

As a front moved over the U.S. East Coast on the 25th, a wave formed near Cape Cod. Ships along the coast were finding 40- to 45-kn winds. On the 27th the outer circulation enveloped both this storm and Karl. A Netherlands Antilles ship PJYS near 37°N, 59°W, called the winds 63 kn and the waves 46 ft among other things. The ROS CASTLE (36°N, 56°W) found the winds to be 60 kn and the waves 41 ft. She had waves over 25 ft into the 29th. At 0000 on the 28th the ANCO PRINCESS near 34°N, 50°W, about 400 mi south-southwest of the 986-mb center found the winds to be 70 kn and the waves 26 ft. On the 29th the winds were generally below 50 kn and the highest waves 25 ft, but the MEONIA measured 58 kn with waves of 26 ft. On the 30th the JOULE (50°N, 28°W) found 39-ft southeasterly swell waves. Later in the day the storm started falling apart and was gone by the 3d.

Tropical Cyclones--A report on tropical cyclones during 1980 may be found on page 79 of the March-April 1981 issue.

Casualties--The Danish schooner CREOLE arrived Las Palmas on the 5th with weather damage. The 500-ton German coaster KAAKSBURG was blown aground (cover) on the Isle of Fundy on the 5th. All seven aboard jumped to the rocky beach. The SIBA EDOLO and the FAITH SULTAN collided in fog in the Bosporus Sea on the 8th. The DAPO ALECOS was beached at Mooring Cove, Newfoundland, on the 8th after heavy weather damage. The 138-ton Turkish UZ RUZGOR grounded on the 10th due to bad weather. The CITY OF LEEDS grounded while at anchor at Antalya during a storm.

The tanker LUCOR MANOR collided with the barge ES-CHRI-JU while maneuvering in the port of Antwerp in dense fog on the 10th. The barges TOSCANA and CLOTAIRE were also involved. The INDIAN VALOUR had to put back to Liverpool on the 15th due to storm damage. The Italian livestock carrier PEZZATA ROSSA and the YEOTA E. collided on the 17th in fog off the Turkish coast. The DOPAS dragged anchor in high winds at East Mersa on the 17th. She refloated on high tide.

The JOANNIS MARTINOS arrived Piraeus on the 22d after having lost 100 small containers from the deck during heavy weather off Malta. The Libyan EBN MAGID sustained heavy weather damage off France on the 21st. The CASTOR 1 broke down near 50.5°N, 04.8°W, in gales. The crew of 12 was evacuated by helicopter. She dragged anchor and wrecked near Tintagel Head. On the 28th the British DARNIA was struck by a huge wave off Lock Ryan and developed a 6° list when vehicles shifted. The crew of 15 was rescued from the British ST. IRENE in gale-force winds 18 mi off the Netherlands.

The 1,594-ton British HARP sank after taking on water in bad weather and a subsequent fire near 35.1°S, 54.7°W. Five crewmen were missing.

SMOOTH LOG, DECEMBER 1980--The storms favored the area within 600 mi of the East Coast then northeastward toward Iceland. The tracks became more diffuse over the central ocean as the storms approached northern Europe. There were several strong storms over the Mediterranean Sea. The usual primary path over the Great Lakes could only be considered secondary, and the climatic track into Baffin Bay was not present.

There were major differences in the mean sea-level pressure and climatology. The Icelandic Low had two centers, the primary one was 993 mb west of Bodo, Norway. The other center was 998 mb near Keflavik. Climatology indicates two centers with the deeper one near 62°N, 30°W, and the second center near 68°N and Greenwich. The Azores High was 1030 mb near 40°N, 18°W, verses 1021 mb over the long term and 500 mi to the southwest. The more intense pressure centers produced a tighter gradient which indicates stronger storms than usual (fig. 34).

The strongest anomaly over the primary shipping lanes was plus 12 mb near Cape Finisterre. This large area dominated the area between 20°N and 60°N and Europe to 50°W. The largest negative anomaly

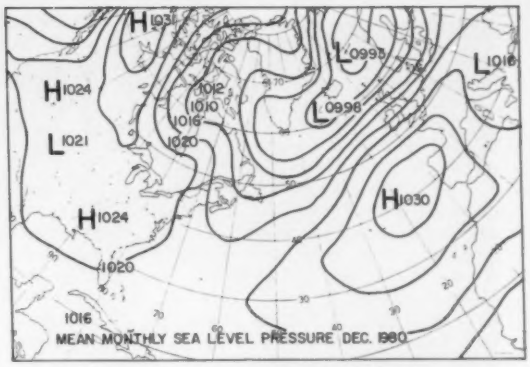


Figure 34. Mean sea-level pressure.

was over the Barents Sea east of Murmansk.

There was an upper air LOW over Baffin Island to match climatology, but the lowest height center was north of Nordkapp. The climatic averages do not indicate this circulation. The upper air High was many miles northeast of its usual position and more intense. A trough paralleled the East Coast. In general, the flow was from the southwest over the primary shipping lanes.

Extratropical Cyclones--The eastern slopes of the Rocky Mountains produced this storm. On the 2d the storm was passing over the Great Lakes. There were gale and storm warnings posted for most of the lakes. There were also lake-shore flood and erosion warnings for the south shores of Lakes Erie and Ontario. Northerly winds gusting above 50 mi/h were howling off the Lakes. Gale warnings were still posted on the 3d with Chesapeake and Delaware Bays added. Storm warnings were issued for the Atlantic coast. On the 3d the storm was centered over New England. The BALTIMORE TRADER, about 200 mi off Norfolk, had 50-kn winds on the 3d and 4th with waves increasing from 20 to 30 ft. A report from a Canadian vessel north of Sable Island at 0000 on the 4th indicated 55-kn southeasterly winds and 25-ft seas. At 1800 three ships including the NANT reported 50- to 60-kn winds and waves to 31 ft off the Virginia to New Jersey coast. On the 5th the storm had two centers. At 0000 on the 6th the LOW was 986 mb near 44°N, 58°W. Between 1200 on the 5th and 0000 on the 6th there were three extreme wind reports: STRATHEDEN (41°N, 62°W), 74 kn; ST LAWRENCE NAVIGATOR (49°N, 68°W), 72 kn; and the EASTERN SNELL (49°N, 64°W), 88 kn.

The storm's gradient loosened on the 6th, and another center formed in the trough to the south. This center moved in a more easterly direction. Late on the 8th the AMERICAN ACCORD (47°N, 28°W) found 45-kn gales and 23-ft seas. The BORGNES found 53-kn winds and 26-ft waves on the 9th near 46°N, 23°W. The eastern edge of the storm was affecting the North Sea, where several observers found winds near 50 kn. The storm died on the 11th southwest of Iceland.

This storm came out of Quebec north of Sept-Iles. At 1200 on the 12th the storm was centered midway between Kap Farvel and Trinity Bay. Three platforms

near 47°N, 50°W, had 50-kn winds. The ANTON DOHRN near Kap Farvel found 48 kn and 20-ft seas. This storm was overtaking another, which was absorbed on the 13th. The gradient was tightening and at 1800 OWS Lima had 45-kn winds. At 0000 on the 14th OWS Charlie was fighting 52-kn winds and 26-ft waves. By 0600 the waves were 30 ft. The AMERICAN ALLIANCE (51°N, 25°W) found 45-kn winds.

On the 14th the storm split into two centers with the eastern one surviving. At 1800 the AMERICAN ALLIANCE reported 50-kn winds and 33-ft swells. The WIDAR near 51°N, 20°W, had winds of 60 kn and 30-ft waves. Meantime, yet another LOW had formed over Scotland and was bringing winds up to 65 kn and waves up to 36 ft to the North Sea on the 15th. The second LOW died out as the third one continued as a strong storm over Scandinavia.

The area north of Montreal produced this LOW. It moved south of a LOW that was over the Labrador Sea on the 15th. The J. LOUIS had 45-kn winds and 28-ft waves at 48°N, 61°W. The DART CANADA was south of Cape Race on the 16th with 57-kn winds and 23-ft waves. Several other ships had winds near 50 kn. Charlie had swell waves up to 33 ft. By 0000 on the 17th the storm had consolidated with two other LOWs and was 960 mb west of Keflavik. At this time the SEPIA was south of the city with 60-kn winds and 28-ft swells, while Charlie had 36 ft and Lima 28 ft. At 1200 the FEDERAL HUDSON (60°N, 23°W) reported 46-ft waves. The English ship GTOT reported 39-ft swells. A ship with the call letters 9VUR was in the North Sea and reported winds of 74 and 72 kn on two consecutive observations and then 64 kn. Lima was still having 33-ft swells into the 18th. The storm was approaching Nordkapp on the 19th and weakening, but its effect was still being felt far to the south by the POSSEHL, north of the Canary Islands, where she found 38-ft swell waves from the north.

There was a complicated low-pressure system off the U.S. East Coast on the 16th. One of several LOWs was off Cape May. It traveled northeastward and developed an elongated circulation off the coast. Waves formed on the front and tended to keep the windspeed down. At 1200 on the 18th the 976-mb storm was 300 mi south of Kap Farvel. A ship in the warm sector near 48°N, 38°W, had 33-ft swells. By 0000 on the 19th, the storm was 966 mb. Charlie was about 300 mi to the south and measured 50-kn winds, 26-ft seas, and 33-ft swells. The front was slightly west of Lima with 45-kn winds. The MONSOON was north of Romeo and both had waves of 20 ft. At 1200 the storm was at 59°N, 19°W. The AMERICAN ACCORD (46°N, 31°W) was 900 mi southwest of the center, south of the front, with 48-kn winds and swells of 41 ft. The CARCHESTER (46°N, 35°W) only a few miles away reported 45-kn winds with 39-ft waves. The storm was about 100 mi north of Lima, who had 30-ft swells. Two ships had 60-kn winds. On the 20th the C.P. DISCOVERER (52°N, 21°W) had 57-kn winds with 20-ft waves. Ships reported waves up to 30 ft south of Ireland. On the 21st the storm was over Denmark and loosing its potential.

This innocuous little cyclone was first found over the St. Lawrence River on the 19th. It was 972 mb 24 hr later over the Labrador Sea. Two ships were hit by 45-kn winds. By 0000 on the 21st the storm had raced to 60°N, 33°W. Kap Farvel measured 40-kn winds, while Charlie had 45 kn and 21-ft seas. The SEPIA (54°N, 41°W) reported 68-kn winds with 30-ft seas and 39-ft swells.

The storm suddenly slowed its forward plunge between 0000 and 1200. At 0600 the wind report from the SEPIA read 136 kn, but this was probably an encoding problem and should have been 70 kn. The swell waves converted to 61 ft. This would probably have been considered transmission or coding also, but at 1200 the FEDERAL HUDSON (56°N, 40°W) reported 56-ft seas and swells. At this time the SEPIA reported 81 kn, 23-ft seas, and 39-ft swells. The LINDA DAN (59°N, 44°W) had 52-kn winds and 36-ft waves. On the 22d the SEPIA's winds and waves had decreased to 60 kn and 23 ft.

The storm stalled near the west coast of Iceland on the 22d until dissipating on the 23d. Strong gales and waves up to 20 ft continued as other low centers continued to support the circulation. The TFL EXPRESS measured 65-kn winds at 1900 on the 22d and 0600 on the 23d east of Trinity Bay. On the 24th OWS Lima measured 50 kn blowing 23-ft seas. A frontal wave swept past Denmark and 10,000 trees were uprooted. One-third of the houses in northwest Jutland were damaged. Two fishermen drowned and a ferry with 53 passengers ran aground.

On the day before Christmas there were two small LOWs off the East Coast, another south of Lake Erie, and another over Quebec. A very large 1047-mb HIGH was centered over Nebraska. By Christmas Day the Quebec LOW had moved southeastward to slightly north of Anticosti Island. Winds gusted to 60 kn in Hampton Roads on Christmas Day as the system strengthened after passage of the front. Three empty colliers collided. The ESSI CAMILLA dragged anchor and drifted against the MERCEDES MARIA, and both vessels drifted about 5 mi and struck the NAIAD. At the time there were more than 100 colliers in Hampton Roads. Yet another LOW had formed over the Labrador Sea. This last LOW consolidated the circulation. There were some gales and waves of 15 to 25 ft south of the front, but the ADM. WM. M. CALLAGHAN found 55-kn winds and 23-ft seas, and the BUILDER found 45-kn winds and 25-ft seas near 51°N, 56°W. By 1200 on the 26th this LOW was 960 mb east of Cape Chidley. The MEEREKATZE (60°N, 48°W) had 54 kn and the ZAPA (47°N, 48°W) 64 kn. The MONSOON (50°N, 41°W) had 28-ft waves. In the southwesterly flow southeast of the front many ships found 20- to 25-ft waves. On the 27th at 0000 the 958-mb LOW was very near Godthab, Greenland, which measured 50-kn winds. A small 968-mb indentation was found on the east coast of Greenland near Angmagssalik. By 0600 it appeared the main low-pressure center had jumped across the ice cap to the east coast LOW, now 958 mb. The weather station on the icecap near 65°N had 60-kn winds. Many ships in the area of the storm between 55° and 65°N and west of 15°W were reporting winds over 51 kn. The ENGEY (64°N, 27°W) had winds as high as 68 kn. Most were not reporting waves, but the GRONLAND (60°N, 22°W) had 33 ft. They increased to 36 ft with 60-kn winds on the 28th. Late that day the LOW was centered near 75°N, 0°W, at 944 mb. Plat-

Figure 35.--High waves combined with high tides wash at the foundations of beach homes. Many were damaged and several destroyed. Star News Photo by J. Nesbitt.

forms in the northern North Sea had winds of 50 kn. It is doubtful there were any ships in the area. Meanwhile, another LOW had formed over Greenland's east coast near 68°N by the 29th. The icecap was again getting 60-kn winds; no waves were reported. The GRONLAND (60°N, 26°W) now had 26-ft seas and Lima 23 ft. The reporter GZOQ (60°N, 0.6°W) had 60 kn and 33 ft. Another LOW was moving past Kap Farvel holding the strong westerly flow across the water north of 50°N latitude. This LOW raced eastward across Iceland, again bringing severe weather to that part of the northern ocean.

On the 26th a high-pressure cell moved off the East Coast near Norfolk. This brought easterly winds to the coast south of there. On the 27th another HIGH was pushing eastward across southern Canada and reinforced the first HIGH continuing the easterly winds. At the same time a LOW developed off Jacksonville, Fla., in an inverted trough. This intensified the easterly winds along the Carolina coasts. Wind-driven waves on top of high tides caused heavy damage to beaches, piers, and beach homes (fig. 35). Carolina Beach and Wrightsville Beach north of Cape Fear were particularly hard hit with several piers and many homes extensively damaged. Up to 3 in of rain fell in the area contributing to erosion problems. The LOW remained stationary south of Cape Fear for about 48 hr. The HIGH was southeast of Newfoundland on the 29th, easing the gradient and the force of the easterly winds.

Monster of the Month (North Atlantic)--This was the same type storm that struck the Carolina coast, described above, and occurred at the same time. It was the result of a high-pressure system that moved eastward across the Atlantic paralleling latitude 40°N. At 0000 on the 27th it was 1052 mb near 43°N, 22°W, or about 600 mi west of Cape Finisterre. On that analysis a LOW had formed over Italy increasing the gradient over the western Mediterranean. Later in the day another LOW formed over southern France, further increasing the pressure gradient. This LOW moved southward toward Constantine, Algeria.

Winds gusting to 70 kn and waves of 25 ft hit the Algerian coast. The ports of Oran, Arzew, Ghazaouet, and Benisaf were particularly hard hit. In Benisaf 22 trawlers were sunk. At Oran five freighters were sunk and many aground and badly damaged. One report said 20 ships were sunk or badly damaged. Torrential rains with snow accompanied the winds. Several people were killed. Piers, breakwaters, and harbor walls were severely damaged.

The eastern coast of Spain was hit by 60-kn winds and 20-ft waves. It appeared more people were killed in Spain than Algeria. On Majorca the waves reached 36 ft, destroying many yachts and boats. The orange crop at Valencia was badly damaged.

Some of the ships that were affected by the storm, in no particular order, included the JUAN A. LAVALLEJA, MAMMOTH SCAN, GOLDEN STAR, FINNTRADER, HUELVA, JACOB BECKER, CHERCHELL, TEBESSA, KAPETAN MARKOS, OUED SOUF, SIVIGLIA, BASTABALES, BENI SAF, SARONIC SKY, CONSTANTINOS, GOGO RAMBLER, IBN ROCHD, ALGERIA, SAM ALEX, INDIAN SECURITY, FAMILY DELTA, VOMAR, BERYTE, ANNA, GIANNIS XILAS, BELAHCEL BOUZEGZA, and the AL SOLAIBIAH.

The LOW crossed the Algerian coast at 0600 on the 28th and stalled near 32°N. The HIGH moved over France at 1042 mb on the 29th. It moved to longitude 10°E before retreating westward on the 31st. The LOW disappeared late on the 31st as the HIGH joined with another approaching from the west. The pressure gradient, winds, and waves were now normal.

Casualties--As if the above were not enough, there were many more this month. Fog was not much of a problem. The DEVALI I and MARSHINA G. collided in fog on the 2d near Louisiana. The ferry PRINSES-SAN DESIREE and STENA TIMER collided near Gothenburg on the 11th. The CHALLENGER, MARACAIBO, and SANKO MAPLE suffered unspecified damage. On the 3d the HANSEAT, LACKENBY, and NORWEGIAN CHALLENGER had weather damage near England. The tanker ASTORIA arrived St. Michael's on the 4th with damage. The MIRANDA grounded in the Weser River, and on the other side of the ocean the dredger SUSANA sank off Coatzacoalcos. In the Mediterranean the AFOVOS, AGIP MILANO, MARK IV, and STARMAN AMERICA had weather problems. The HALLFAX had weather problems off Gaspe in 50-kn winds and part of the crew was evacuated by helicopter.

The weather over the eastern Mediterranean continued to plague ships from the 7th to the 10th. The ANGELIKI Z lost control off the Albanian coast. The GEORGIOS D., OSWEGO CONCORD, and VOSGES had weather problems. The TENIA II anchored off Turkey to inspect their cargo after heavy weather in the Black Sea and stranded in strong northerly winds. On the 11th the barges TRINACRIA PRIMO and TRINACRIA SECONDO sank on the Israel coast during a storm. That same day the LOUCY sank off Karpathos Island. The crew of 14 was rescued by helicopter. The bulkcarrier D.G. KEER sank near Santa Marta Island due to leakage in bad weather while being towed.

The CON ZELO struck a quay at Treport. The SAUDI INDEPENDENCE drifted into the WILD FLAMINGO at Bremerhaven in high winds on the 17th. The JUNIPER sustained heavy weather damage on the 19th enroute to Marseilles. The ANNA DRENT lost containers overboard off Greece on the 19th in heavy weather. The DOMINION UNITY and GIANNAKIS collided during bad weather on the 19th at Perama.

The T.R. MCLAGAN and H.M. GRIFFITH suffered damage when they brushed in ice in Quebec harbor on the 22d. The LAKESHELL grounded on Telegraph Rock in near gale-force winds and heavy ice. The CHARLOTTE MAERSK arrived Savannah on the 23d with damage to containers. The SUNNY BETTINA lost steel pipes overboard off Brest on the 27th in adverse weather. The JEANNIE dragged her anchors in severe winds at Narvik and collided with the FIRST VENTURE on the 28th. The LAGO LLANQUIHUE reported weather damage on the 30th. The ASEAN KNOWLEDGE under tow to Baltimore by the HEIDE MORAN was hove to on the 30th in gales and heavy seas on the 29th and 30th.

Some late casualties. The Cypriot SUN RISE ran aground after taking on water in heavy weather on the 5th near 37°N, 09°E. She broke in two and sank. One crewman was missing. The OCEAN CHAMPION sank near 31.6°N, 32.4°E, on the 11th after the towline broke in heavy weather. The crew was rescued by helicopter.

The SWEDE TONIA encountered heavy weather off South Africa on the 21st, 23d, and 24th.

Smooth Log, North Pacific Weather

November and December 1980

SMOOTH LOG, NOVEMBER 1980--The primary storm path originated in the proper place this month, over Sakhalin Island, but it tracked due east instead of northeastward as climatology dictates. A secondary track started off Japan and joined the primary one as it moved into the Gulf of Alaska. Another track began 600 mi south of Dutch Harbor and moved into the lower Gulf of Alaska.

The sea-level pressure pattern closely resembled climatology. The Aleutian Low was 995 mb about 100

mi south of Kodiak Island. A second 999-mb Low was on 180° near 55°N. The climatic normal shows three Lows along latitude 53°N of 1001 and 1002 mb. The Pacific High was 1024 mb near 32°N, 133°W, about 500 mi east of its usual position and 4 mb higher in pressure (fig. 36).

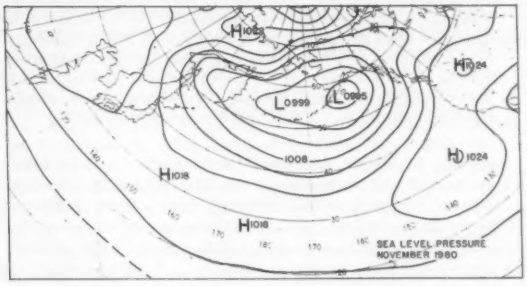


Figure 36.--Mean sea-level pressure.

The anomalies were relatively small. There were two minus 8-mb centers, one near Anchorage and the other over the northern Sea of Okhotsk. There was a small plus 4-mb anomaly center west of San Francisco. Also, there was a large positive anomaly area with a 13-mb center near 85°N, 170°W, over the Arctic Ocean.

The upper air flow was primarily zonal over water, except for a trough approximating 160°W and a ridge over the Rocky Mountains.

Typhoon Dinah roamed the western ocean.

Extratropical Cyclones--The first storm of the month came out of a sharp trough east of Japan. The first strong winds were 50 kn with waves of 28 ft reported by the OSLO VENTURE (35°N, 156°E) about 500 mi southwest of the center. By 0000 on the 5th the storm was 972 mb near 41°N, 177°W. Several ships reported gales, and the ATLANTIC PIONEER (38°N, 176°W) had 55-kn winds. The ARILD MAERSK (35°N, 169°W) was pounded by 39-ft swell waves, and the FRIENDSHIP at 41°N, 166°W, had 60-kn winds and 33-ft waves which continued into the 6th. The next day the central pressure was 964 mb. The PRESIDENT POLK (43°N, 158°W) had 45-kn winds, as did the NEPTUNE DIAMOND (46°N, 164°W) with 30-ft waves. Another ship had 52 kn. On the 7th the MEIHOU MARU, 250 mi south of the center, found 33-ft swell waves. A second center to the northeast had formed at this time, and by 1200 it dominated the circulation. At 0100 the LNG AQUARIUS logged a special observation of 60-kn winds and 30-ft waves. The BLESS RIVER was far south near latitude 38°N with only gales of 35 kn or less, but the storm propagated swells up to 44 ft on the 7th and 8th. There were mostly only gales at this time, and this is what the NEPTUNE AMBER measured in the Gulf of Alaska (53°N, 143°W), but again the swell waves were 39 ft. The storm moved across the mountains into interior Canada.

Monster of the Month--This frontal wave formed on a front out of a LOW that moved out of Asia. By 1200 on the 8th the two LOWs had combined. At 0000 on the 9th the storm was 966 mb. The circulation covered half of the ocean north of 40°N. The EASTERN HOPE at 47°N, 172°E, near the point of occlusion had 45-kn winds and 30-ft waves. The PRESIDENT KENNEDY (43°N, 149°E) found 47 kn and 23 ft. At 1200 the storm was 947 mb as measured by Ostrov Beringa. At 2100 the IKAN KERISI (52°N, 166°E) found 65-kn winds that increased to 70 kn on the 10th. The 0000 scan of the 10th had a Soviet ship near 52°N, 165°E, with 62-kn winds and 30-ft waves and the GRAND GLOBE (53°N, 168°E) with 60-kn winds and seas and swells of code 40 (66 ft). This could have been a transmission error, but the ALASKA MARU nearby at 52°N, 170°E, reported 66-ft swell waves. Except for the 0300/10 observation when she reported 23-ft swell waves, it appears she had at least 49-ft swell waves through 0600 on the 11th. Her winds were at least 50 kn through 1200 on the 10th. She experienced considerable damage including a 20-m crack near the bow and about 60 containers damaged; about $1 million damage. She spent 10 days in a shipyard. The 23,578-ton container vessel has been on this Pacific route since 1973. She is a highly valued reporter (fig. 37), both accurate and reliable. Thanks. The SEKISHU MARU (46°N, 176°W), 600 mi south-southeast of the 958-mb center, had 64-kn winds and 33-ft seas on her stern. The HIRO MARU (51°N, 169°E) had 34-ft waves. By 1200 they were only 33 ft.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
99	$L_aL_aL_a$	Q_c	$L_{oo}L_{oo}L_{oo}L_{oo}$	YY	GG	i_w	N	dd	ff	VV	ww	W	-	PPP	TT	-	-	N_h	C_L	h	C_M	C_H	D_s	T_x	s_n	RR	0	T_xT_x	T_dT_d	1	$T_xT_xT_x$	T_T	P_xP_x	H_xH_x	d_wd_w	P_{ss}	H_sH_s			
99	534	1	1777	09	00	4	8	12	25	93	51	2	10	030	05			8	6	4	/	/	6	4	7	70	0	//	03	1	070	0	3	04	03	14	8	06			
99	524	1	1701	10	00	4	7	23	55	93	62	6	9	690	02			7	6	4	/	/	5	2	2	10	0	//	01	1	070	0	3	05	14	33	0	40			
99	522	1	1698	10	03	4	8	23	56	93	62	6	9	695	02			7	7	4	/	/	5	2	2	05	0	//	01	1	070	0	3	06	07	23	9	14			
99	519	1	1693	10	09	4	8	24	54	93	26	7	9	715	01			8	7	4	/	/	5	1	2	20	0	//	00	1	065	5	3	06	07	25	0	30			
99	515	1	1682	10	21	4	7	28	32	95	25	8	9	815	02			6	7	4	5	/	5	1	2	30	0	//	01	1	065	0	3	06	07	27	0	30			
99	514	1	1676	11	00	4	8	29	22	93	26	8	9	855	01			8	7	4	/	/	5	1	2	30	0	//	00	1	065	5	3	06	07	27	0	30			
99	512	1	1675	11	03	4	8	30	21	92	72	7	9	870	02			8	7	4	/	/	5	2	2	15	0	//	01	1	070	5	3	06	06	29	0	30			
99	509	1	1671	11	06	4	8	28	31	93	60	6	9	910	03			8	7	4	/	/	5	2	2	40	0	//	03	1	070	0	3	06	06	28	0	30			
99	502	1	1667	11	09	4	8	28	33	96	03	2	9	960	03			8	7	4	/	/	5	2	2	50	0	//	52	1	065	0	3	06	06	27	0	20			
99	497	1	1665	11	12	4	7	28	31	96	02	1	10	000	03			7	7	4	/	/	5	3	2	40	0	//	52	1	065	0	3	06	06	27	0	20			

Figure 37.--Selected observations that were transmitted by radio by the ALASKA MARU.

The storm quieted on the 12th as a LOW on the periphery moved into the Gulf of Alaska, and yet another approached from the west along latitude 49°N. By the 14th the original LOW had disappeared. On the 12th and 13th the PRESIDENT TYLER was in the middle of a HIGH over the central ocean (36°N, 180°) with swell waves up to 34 ft that were propagated by this storm.

A LOW moved eastward from Korea on the 12th. On the 13th ships near Japan were finding winds near 40 kn. On the 14th the POLAR ALASKA measured 43-kn winds. The LOW was 970 mb over the west coast of Kamchatka on the 15th. Another weak center was found near 45°N that day. The NEPTUNE AMBER at 42°N, 155°E, measured 45-kn winds with 49-ft seas and 66-ft swells. A ship of Singapore registry at 41°N, 154°E, reported 70-kn winds and 33-ft swells behind the trough on the 15th. On the 16th there were reports of measured winds up to 46 kn. The EASTERN WORLD reported 45 kn with 41-ft swells. At 0000 on the 17th the 972-mb storm was near Umnak Island. The TOYOTA MARU No. 10 was near 48°N, 171°W, with 66-kn winds, 30-ft seas, and 39-ft swells. At 0600 the winds had decreased to 50 kn, but the waves remained the same. When the 18th rolled around the NEWARK (55°N, 139°W) had 45-kn winds and the PRINCE WILLIAM SOUND (54°N, 136°W) had 47-kn winds with 16-ft waves. Other ships south of the storm were experiencing 20- to 25-ft waves. Gales continued into the 19th as the storm moved ashore near Valdez.

This storm originated as a frontal wave about halfway between Hawaii and Kodiak. It raced northward. By 1200 on the 15th there were three centers over the Gulf of Alaska with a tight gradient between them and the coast. The OCEANOGRAPHER (50°N, 140°W) measured 52-kn winds and 16-ft waves. The WMCV (53°N, 138°W) had 50 kn and 17-ft seas. By 0000 on the 16th the WNFL and WMCV were reporting 60-kn winds. The PRINCE WILLIAM SOUND measured 80-kn winds and came in with the wave honors of 49 ft near 58°N, 145°W. The ARCO SAG RIVER had 39-ft waves near 56°N, 142°W, and the PHILADELPHIA was only a foot behind with 38 ft near 56°N, 142°W. The LOW was inland on the 17th and of no consequence.

This storm came off the Asian mainland on the 20th. It was already well organized as it passed over Sakhalin Island. As it passed over the Kurile Islands early on the 20th, a Soviet ship radioed winds of 62 kn and seas of 26 ft. On the 22d the CHIKURU MARU (46°N, 164°E) had 61-kn winds and 26-ft waves. The STREAM HAWSER (48°N, 160°E) reported 49-kn winds and 43-ft seas. Several other ships reported waves near 25 ft. On the 24th a small LOW and trough were rotating around the circulation. The HONSHU GLORIA (47°N, 172°W) reported 52-ft waves on the west side of the trough. Later in the day the storm weakened as it moved up the Alaska Peninsula. A few gales were still being reported.

A weak LOW was discovered over midocean on the 25th. It moved eastward rapidly. On the 26th there were two centers, and the storm was growing. There were some gale reports. Later in the day the weather became more severe. The AMERICA SUN and another ship near 57°N, 142°W, had winds above 50 kn and 30-ft waves. The EXXON NEW ORLEANS at 57°N, 143°W, measured 80-kn winds from the east blowing 17-ft seas with 33-ft swells. The ORIENTAL MERCHANT (49°N, 143°W) measured 50-kn winds, insignificant 10-ft seas, but highly significant 53-ft swells. By the 27th the storm was howling about a 950-mb center near 56°N, 145°W. Many ships had winds greater than 50 kn and waves higher than 30 ft. Among them was the WESTWARD VENTURE northwest of and near to the center (955 mb) with 76-kn northerly winds. The storm moved ashore late in the day and quickly fell apart. The SHINKO MARU radioed for assistance after her deck cargo shifted in 30-ft waves 450 mi off British Columbia. OWS Papa went to her aid.

Honshu produced this well-built storm. It was already producing storm winds on the 26th around a 980-mb center. Both the ITALY MARU and GBQR in the vicinity of 35°N, 151°E, had 60-kn winds and waves up to 26 ft. The GBQR was sailing eastward with the storm with winds over 60 kn and waves as high as 46 ft. The TYSON LYKES (fig. 38) was sailing westward 450 mi southwest of the center with 64-kn winds and waves of 62 ft. Winds continued only slightly abated into the 28th. The 26, 389-ton Italian bulkcarrier SANDALION took water in two holds when hatch covers broke in heavy weather near 30°N, 159°E. The crew abandoned the vessel on the 29th to the ARAUCO. The fate of the SANDALION was unknown, but it probably sank. At 0000 on the 28th the storm was 968 mb near 43°N, 169°E. Winds over 50 kn with waves over 30 ft continued. The PRESIDENT HOOVER (35°N, 170°E) had 36-ft seas and 66-ft swells on the 28th and 41-ft seas and 49-ft swells on the 29th.

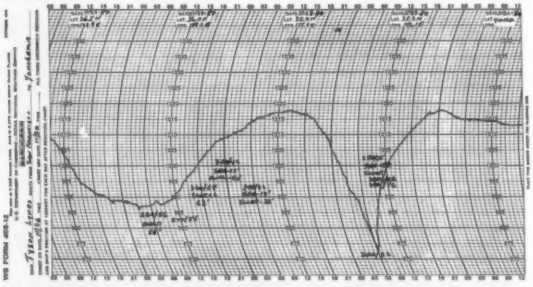


Figure 38.--The barogram of the TYSON LYKES with the wind and wave observations annotated on the form.

On the 28th a second center was found. It sped off to the east while the original one turned northward. The winds died, but there were still high swell waves in the northwest flow. On December 1 the storm crossed the Chukotskiy peninsula and redeveloped over the Arctic Ocean.

This storm came out of the East China Sea. The LOW was 999 mb east of Tokyo on the 29th. The SIFNA at 35°N, 141°E, found 60-kn winds and 26-ft seas and the ATROPES ISLAND (35°N, 144°E) had 65-kn winds and 23-ft seas at 0000 and 0600, respectively. At 0000 on the 30th, the ORIENTAL STATESMAN was within 2 mb of the 975-mb center and at 0600 measured 70-kn winds. No seas were reported. The SEALAND MARINER had 41-ft swells nearby. The ATLAND (34°N, 154°E) was buffeted by 60-kn winds and 39-ft seas.

The storm was 978 mb on December 1, but for some reason the reported winds were much lighter than expected, although the swell waves reached 30 ft. The central pressure was rising, and the strongest wind on the 2d was 50 kn north of the center. The storm dissipated somewhat on the 3d, but it regenerated on the 4th as it circled counterclockwise south of the Fox Islands. The PRESIDENT JEFFERSON (54°N, 172°W) radioed winds of 55 kn and waves of 23 ft on the 5th. On the 6th the storm was part of a three-center circulation.

Tropical Cyclones--Typhoon Dinah developed on the 21st and moved on a nearly perfect parabolic curve for the next 4 days. The first part of the track took her close to Saipan as winds climbed to a peak of 100 kn early on the 23d. Dinah then swung northward and northeastward passing midway between Iwo Jima and Marcus Island as winds began tapering off. By the 25th the weakening system had crossed the 30th parallel near 160°E.

Casualties--The Greek NAFTOPOROS touched bottom on the 4th near Balboa and developed a list. Vessel was beached on the 5th due to heavy swell. The Liberian WORLD PRIDE requested a heavy-weather damage survey at Kobe on the 10th. The KRITI EMERALD suffered weather damage on voyage Dammam to Japan during the 11th to the 17th. The SIN RA No. 7 was beached near Aomori on the 13th after taking water in the engineroom during heavy weather. The crew was taken off by helicopter. The ORIENTAL TRADER dragged anchor in strong winds at Tsuruga and contacted the EISHIN MARU. The bulkcarrier GRAND GLOBE requested a survey at Kobe on the 17th.

Seventeen crewmembers of the SUNSHINE ISLAND were rescued by the SEA-LAND PATRIOT in heavy seas 1,500 mi east of Japan on the 14th. The tug OCEAN DISCOVERER connected a towline on the 22d, but the towline broke on the 25th in heavy weather from typhoon Dinah. The Chilean ARAUCO needed repairs from weather damage that occurred on voyage from Hong Kong upon arrival at Kobe.

The OINOUSSAI ALPHA, SPECIALIST, and ZEEBRUGGE were all at Kobe with weather damage.

Other Casualties--The TOORONGA had heavy-weather damage at River Yarra on the 2d and 3d. A 200-ton crane barge capsized in bad weather 60 km from Bahrain while in tow. Four barges loaded with timber at Port Kelang were sandwiched between three ocean vessels which strong currents sent crashing into each other. No one was injured, but damage was estimated at $1 million.

SMOOTH LOG, DECEMBER 1980--Climatologically, this was an anomalous month. Both the storm tracks and mean-pressure pattern were vastly different from the long-term normal. Climatology indicates the storm tracks from the vicinity of Japan tracking northeastward to Kamchatka or to the western Aleutian Islands, then eastward into the Gulf of Alaska, and also from midocean northeastward to the Canadian coast. This month the primary track was from east of Japan eastward to the vicinity of 155°W, then north and northeastward into the Gulf of Alaska. This placed the trace of the storm centers much farther south than usual.

The pressure pattern reflected the paths of the storms. The normal indicates the Aleutian Low with two centers less than 1000 mb, one near the Rat Islands and the other about 250 mi southeastward of Kodiak Island. This month the Aleutian Low was 993 mb near 44°N, 167°W. This was about midway between the two climatic Lows but about 10° latitude farther south. The Low also penetrated much farther south, to the latitude of Hawaii. The Pacific High was near normal off the California coast. Either as a result of or contributing to the southerly position of the Aleutian Low, a long tongue of the Asian High stretched across the Chukchi Sea into northwestern Canada (fig. 39).

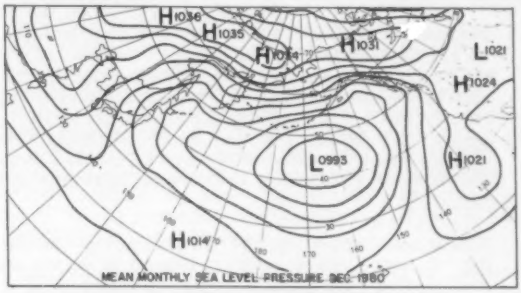


Figure 39.--Mean sea-level pressure.

There were two large anomaly centers. The most immediate one for ships was minus 17 mb near 40°N, 162°W. The other was plus 18 mb over eastern Siberia near 65°N, 170°E. The zero isoline waved along the 50°N parallel.

The upper air height pattern reflected the surface pattern. There was an anomalous Low near 46°N, 170°W, in addition to the normal Low near Sakhalin Island. There was also an anomalous High over eastern Siberia, north of and between the two Lows.

Tropical storm Ed plied the far western ocean.

Extratropical Cyclones--A frontal wave was the origin of this storm. It moved eastward but on the 3d turned southeastward as it responded to an upper air cutoff LOW. On the 4th there were a few gale reports west of the 992-mb center, with the SANKOSTAR at 34°N, 166°E, reporting 26-ft waves in northeasterly winds. The SARGODHA was southeast of the storm near 28°N, 173°W, measuring 20-kn winds, but the swell waves were 34 ft from the southeast. The storm turned northeastward on the 5th as it moved to the eastern side of the upper air LOW. At 1200 on the 5th the storm was 984 mb near 33°N, 166°W. The TOWNSEND CROMWELL at 26°N, 171°W, found 45-kn winds with 20-ft swell waves. On the 6th the primary upper air LOW was near 46°N, 173°W. There were two other surface LOWs associated with the upper air center and this LOW was joining them. The wind wave analysis showed an area of 12-ft waves, but it did not indicate the 30-ft swell waves reported by the VALENE near 28°N, 163°W. The FALCON BAY, not far away near 26°N, 165°W, reported 68-kn winds as she passed through a trough behind the front. By 1200 on the 6th two of the three LOWs had combined into one and this one became the primary storm. At 0600 the CGC SHERMAN near Adak Island

reported 55-kn winds with 21-ft seas and at 1200 the STORIS near Unimak Island radioed winds of 60 kn driving 25-ft seas. The fishing vessels LIN J, SEYMOUR, and PRIBILOF, among the Aleutians reported 50- to 90-kn winds gusting to 100 kn with waves up to 20 ft. The SHERMAN was still having 60-kn winds on the 7th, and the SILVER PHOENIX, about 250 mi to the south, was contending with 31-ft seas and 50-kn winds. Saint Paul Island measured 50-kn winds. The NEW GOLDEN PHOENIX (48°N, 170°E) was on the western edge of the storm with 65-kn winds. Swell waves of 20 ft were fairly common, but on the 6th and 7th the CGC JARVIS contended with waves over 30 ft near 59°N, 176°W. At this time the storm was 960 mb.

By the 8th the winds were generally gales, but to the south of the LOW some swells had built as high as 31 ft with 10 to 15 ft much more common. At 0000 on the 9th a ship reported 45-kn winds about 200 mi west of the center and at 1200 the PRESIDENT TYLER (40°N, 168°W) was sailing with 25-ft swells on her stern. The surface LOW was nearly vertically alined with the upper air and moving in small loops. On the 10th it became stationary before being absorbed on the 12th.

This storm formed over the Sea of Japan late on the 8th. It moved across northern Honshu on the 9th and continued on a due easterly track. By 1200 on the 11th it was near 42°N, 163°E. Two Japanese ships near 40°N, 160°E, had 45-kn winds. At 2100 the ASIA MARU (40°N, 166°E) had 60-kn winds. Two ships almost 400 mi west of the storm center had swell waves over 30 ft on the 12th. At 0600 on the 13th the CGC MUNROE was near Lisianski Island with 45-kn winds. There were two reports of swell waves over 30 ft southwest of the 980-mb LOW. At 1200 a ship had 36-ft swells northwest of Midway. The NEDLLOYD NAGOYA (29°N, 157°W) was near the front at the time of the 0000/14 analysis and was sailing into 60-kn winds and 49-ft waves. On the 14th and 15th the TYSON LYKES was between 24°N, 176°W, and Honolulu with force 6 winds, but the swell waves ranged from 20 to 25 ft. On the 15th the DANAH was north of the LOW with 47-kn winds and 33-ft swells. On the 16th the swells were 25 ft. By 1200 the LOW had dissolved.

So far this month, high pressure had dominated eastern Siberia, the Bering Sea, and, to a lesser extent, Alaska. There was a weak low-pressure area over Alaska on the 15th and 16th, but high pressure was building in rapidly from the Arctic Ocean on the 17th. By the 0000 analysis on the 18th there was a 1064-mb HIGH over the Alaska-Yukon border and the Yukon River. High pressure remained over the area gradually decreasing to 1011 mb by December 30.

This LOW came off the Korean Peninsula on the 10th. It was pulling very cold air off the Asian mainland over the Sea of Japan. By 0000 on the 13th the 982-mb storm was over the Tartar Strait. The front had swung as far east as 153°E. There were over half a dozen ships along and east of the front with winds greater than 41 kn. The JINDALLE (46°N, 155°E) found 58-kn winds with 20-ft waves. The AMERICAN CHIEFTAN (34°N, 152°E) had 25-ft swells. At 1200 the GBQX (35°N, 154°E) found 50-kn winds, 20-ft seas, and 44-ft swells.

The LOW was drifting eastward. A frontal wave moved northward then northwestward and reinforced the storm. On the 14th and 15th isolated ships reported winds up to 50 kn and waves to 30 ft. On the 16th the LESLIE LYKES called the winds 55 kn and the waves 33 ft. A new LOW had formed to the south. It moved eastward then curved northwestward. On the 16th this became the more powerful storm. The CHARLES LYKES at 48.5°N, 173.3°W, had cargo handling equipment break loose with damage to it, the hull, and cargo. Several ships reported 60-kn winds on the 17th and waves as high as 38 ft. The LESLIE LYKES was still calling the winds 55 kn and had the 38-ft waves. The WRANGELL MARU at 50°N, 169°W, had 65-kn winds. The PRESIDENT TAYLOR was north of the Aleutians with 50 kn and 25-ft waves on the 18th. The DIANA nearby called the windspeed 72 kn. The JUSTINE FOSS was near Unimak Pass on the 17th and 18th with 50- to 60-kn winds and 20- to 30-ft swell waves. The two LOWs combined on the 18th and then broke into multiple weak centers.

This storm started with one of the LOWs that split out of the previous storm. The center traveled southward, then eastward. On the 21st the storm was near 46°N, 161°E, at 977 mb. Several ships had gales and strong gales. The PRESIDENT KENNEDY (43°N, 148°E) had 45 kn and 30-ft seas. The FORT VICTORIA found 47-kn winds and 30-ft swells near 34°N, 172°E, on the 23d. She ran into 39-ft swells on the 24th, but the storm was weakening.

This storm was the consolidation of several small LOWs north of Hawaii on the 22d. It was 970 mb on the 23d. There was a strong gradient north of the center. A ship was near 54°N, 154°W, with 60-kn winds. There were reports of gales on the 24th. The IRIS ISLAND (48°N, 154°W) had 45-kn winds and 36-ft swell waves. With the demise of the storm above, this storm, though not particularly severe, covered the northeastern ocean north of a line from California to Hawaii and east of 180°. The most vicious part of the storm was the waves. On Christmas Day the British GOVH (30°N, 159°W) had 55-kn winds driving 33-ft seas and 39-ft swells. Others were having 20 to 30 ft. The storm stalled near 50°N at this time as other centers moved through the eastern circulation. The winds now were mostly gales with waves of about 20 ft. This storm system was the first to approach the North American coast since the 14th.

The point of occlusion of a front near Tokyo produced this LOW on the 23d. It deepened rapidly and by 0000 on the 24th was producing winds over 50 kn and waves over 25 ft. A U.S. ship, sailing toward Tokyo, had 54-kn winds and 15-ft waves. On the 25th the JINDALLE had departed Tokyo Bay and had 64-kn winds out of the north with 41-ft swells. Other ships had winds around 50 kn and waves of 20 to 30 ft. The charts on the 26th had many high wind and wave reports. The AMERICAN LEGION (35°N, 159°E) had 33-ft waves, and the FORT VICTORIA (33°N, 159°E) had 51-kn winds and 46-ft swell waves. Waves of 20 to 25 ft continued into the 27th. The LOW dissipated by the 28th.

Monster of the Month, North Pacific--This storm was a series of LOWs that were very hard to accurately

track from one chart to another. The previously described storm was actually the first one in this series. On the 26th a LOW formed east of Tokyo. At 1200 the NEW GOLDEN PHOENIX was near the center of the new circulation and reported 54-kn winds. On the 27th two ships in the area of 35°N, 150°E, had near 60-kn winds. Others farther south had 25-ft waves. There were still winds of 50 kn and waves up to 33 ft on the 28th. The Liberian bulkcarrier WORLD FUJI with 11,000 tons of coal developed a crack in her hull while anchored off Amagasaki port on the 27th in strong winds. Twenty-seven of the 29 crewmen were transferred to Japanese vessels. The bulkcarrier ARTEMIS laden with logs took water through No. 1 hatch in heavy weather on the 28th about 270 mi southeast of Nojima Saki. The crew was rescued and a tug was standing by to pump out water for towing.

The Yugoslavian bulkcarrier DUNAV (25,200 tons) with 31 aboard sent a distress signal on the 28th while about 700 mi southeast of Chiba. She was taking on water in stormy seas, and all contact was lost. She was presumed lost after an air and sea search failed to locate the ship.

The ONOMICHI MARU (56,341 tons) was in distress from taking on water in cracks in her bow from rough seas on the 29th. She was about 800 mi southeast of Nojima Saki. The Japanese ore carrier DAMPIER MARU was standing by to rescue the crew. The Indonesian GARSA TIGER (3,139 tons) sank in rough weather near 29°N, 132°E, on the 29th. Eighteen crewmen were rescued, 11 by the ROYAL EAGLE and 7 by helicopter from a liferaft. Six were missing.

The VISHVA AMITABH and the SEIUN MARU No. 10 collided in strong winds on the 28th in Mutsure Anchorage.

At this time it appeared that the original LOW had disappeared, and new ones developed both to the east and west. The winds were mostly gales, but there were isolated reports of 50 kn. The waves were 20 to 25 ft, but the TAGALUS (30°N, 138°E) found 43-ft waves. The westerly flow had persisted in this area for many days. On the 30th there were three ships near 31°N, 152°E, with winds near 50 kn and up to 30-ft seas and swells.

There was now a large cyclonic circulation with multiple centers that reached from coast to coast and 25°N to the Bering Strait. At 1200 the analysis showed eight low-pressure centers in or on the periphery of this circulation. High winds and seas accompanied the various centers as they developed and then dissipated. Generally, winds were gale force and waves ranged from 20 to 25 ft. The large system started breaking up on January 3.

Tropical Cyclones, Western Pacific--Tropical storm Ed was first observed as a disturbance near Yap on the 14th. Moving westward at 12 to 15 kn he began to organize. By the 16th maximum winds climbed to 50 kn around a 991-mb pressure center. Maximum winds were observed in the northeast quadrant of the storm. However, Ed was moving into an area which was considered unfavorable for continued development. On the 17th he began an erratic clockwise loop some 150 mi east of the central Philippines. A strong surface ridge extended from the Asian mainland north of the storm and maintained a strong northeasterly low-level flow in the vicinity of the Philippines. At the same time a strong southwesterly flow at 200 mb was present off the east coast of the Philippines. The resultant strong wind shear caused Ed to weaken. After most of his convection had been sheared off, Ed began moving southwestward on the 20th. The 3,023-ton EASTERN CLIPPER listed and sank near Rapu Rapu Island on the 21st. The 25 crewmen were missing. By the 24th Ed had dissipated over northern Mindanao.

Casualties--The following ships either reported heavy weather damage or requested a survey this month. They were the AEGIS DORIC, KYOTO, REGAL SCOUT, SISSILI RIVER, APLI CHAU, SEMIRA, AQUAGEM, KILMORE, BARRY, ISLA FLOREANA, DELTA VENTURE, VELA, Barge CMC 450-10, and MARTHA MARINER.

The 29,398-ton Peruvian bulkcarrier CAPIRONA cracked her hull near 27°N, 168°E, on the 5th. All of the crew were safely taken aboard the NEW SULU SEA. The tug SMIT NEW YORK located the vessel in 20-ft seas. The tug MOANA HOLO was at Midway awaiting salvage and survey party. The winds were 50 kn and seas 24 ft at Midway.

The 83,729-ton American LNG carrier LNG TAURUS ran aground near Moji, Japan, in the Mutsure Anchorage on the 12th in strong northwest winds. She was freed on the 16th. Her master reportedly shot himself. The MOCK NAN also grounded in strong winds on the 13th near Sakota port. The midbody of the CLARA MAERSK under tow grounded near 35°N, 126°E, during heavy weather on the 20th.

On the 20th, the 7,279-ton TRANSOCEAN RAM and the 11,086-ton CLAIRE A. TSAVLIRIS collided in fog about 25 mi west of San Diego. The dredger SEALANE being towed to breakers listed heavily on the 25th in heavy weather.

Weather problems by the CHARLES LYKES, WORLD FUJI, DUNAV, ONOMICHI MARU, GARSA TIGER, VISHVA AMITABH, SEIUN MARU, and ARTEMIS are described in the Logs.

Other Casualties--Barges from the BENJAMIN HARRISON broke tow in high winds and rough seas while unloading at Hodeidah, Yemen, on the 5th. The LYSAGHT ENTERPRISE reported damage during high winds on the 17th at Sydney. She also struck the bulkcarrier TECTUS. The bulkcarrier CAPTAIN LEMOS grounded at Dammam in strong winds on the 18th.

Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic

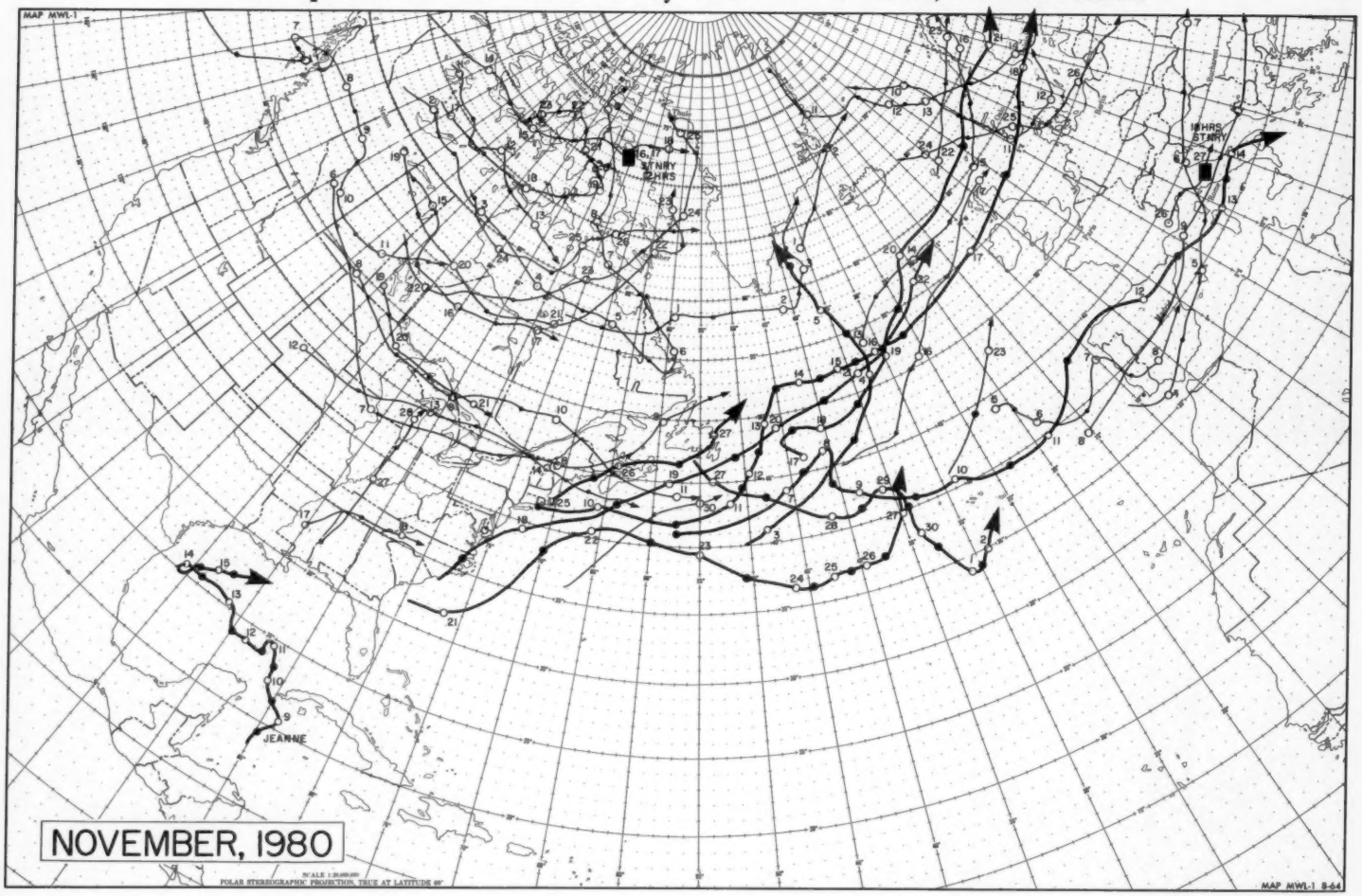


Figure 40. --Open circle indicates 1200 GMT position and closed circle 0000 GMT position. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Smooth Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic

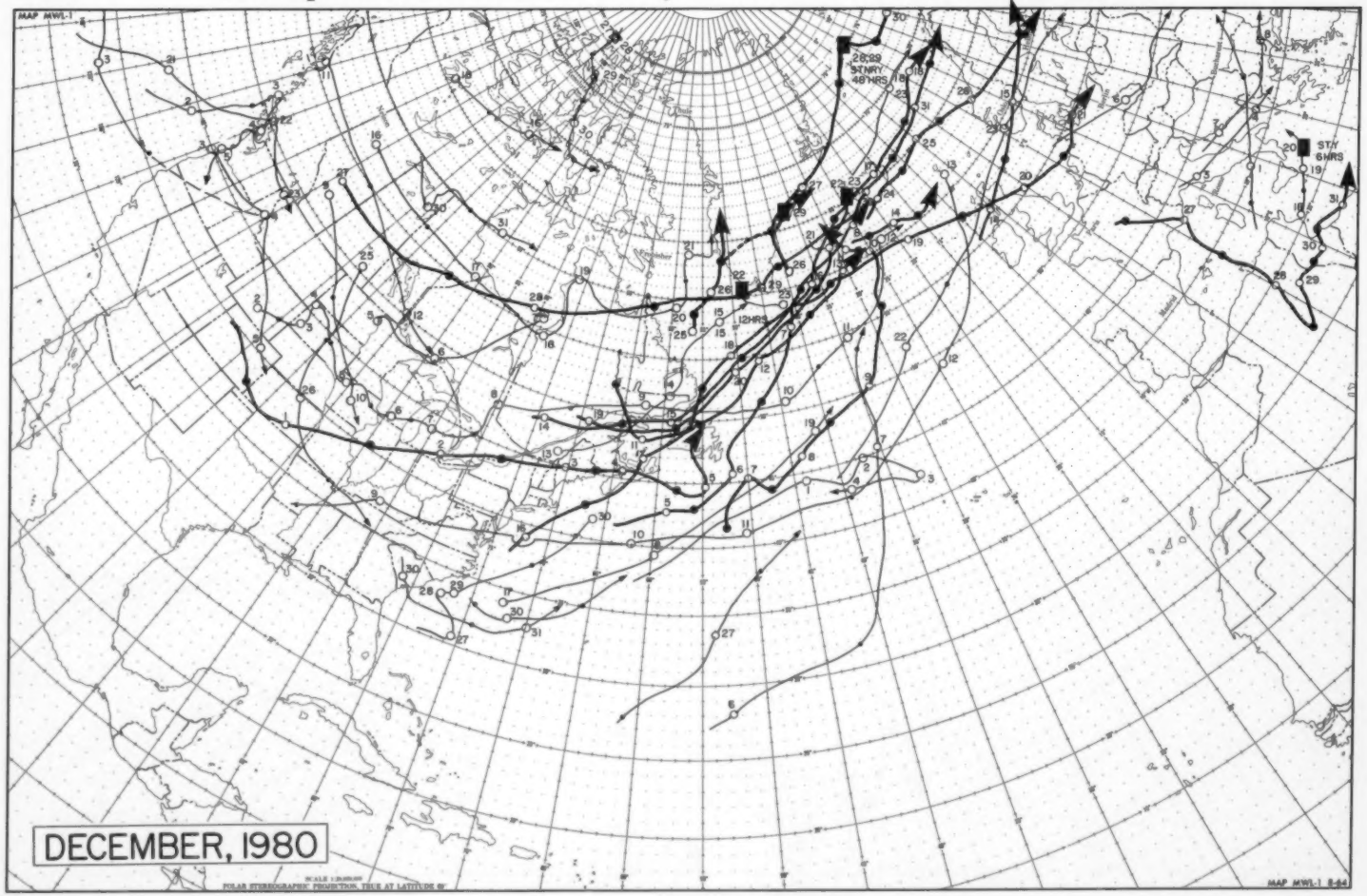


Figure 41.--Open circle indicates 1200 GMT position and closed circle 0000 GMT position. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Smooth Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Pacific

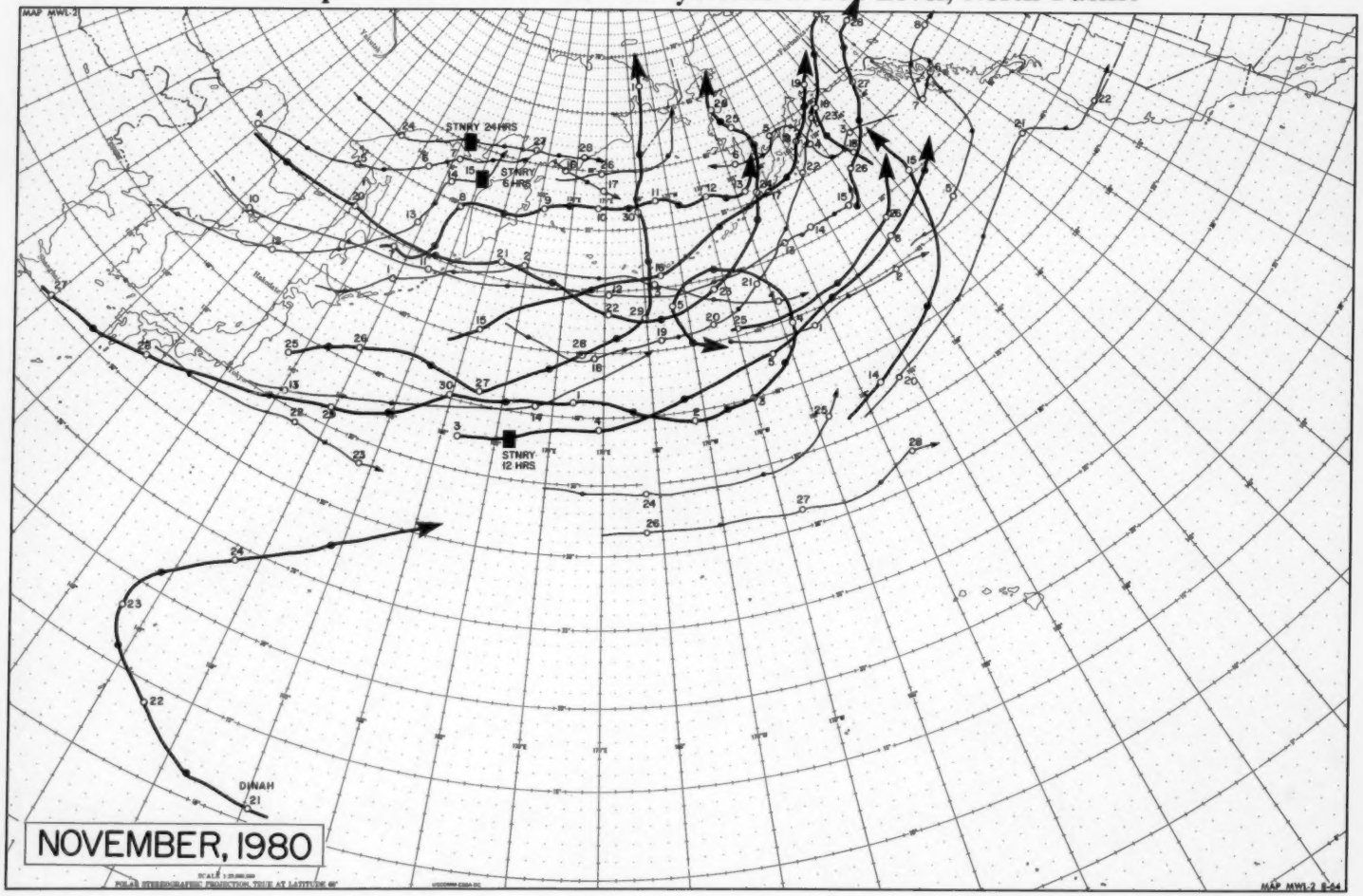


Figure 42. --Open circle indicates 1200 GMT position and closed circle 0000 GMT position. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Smooth Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Pacific

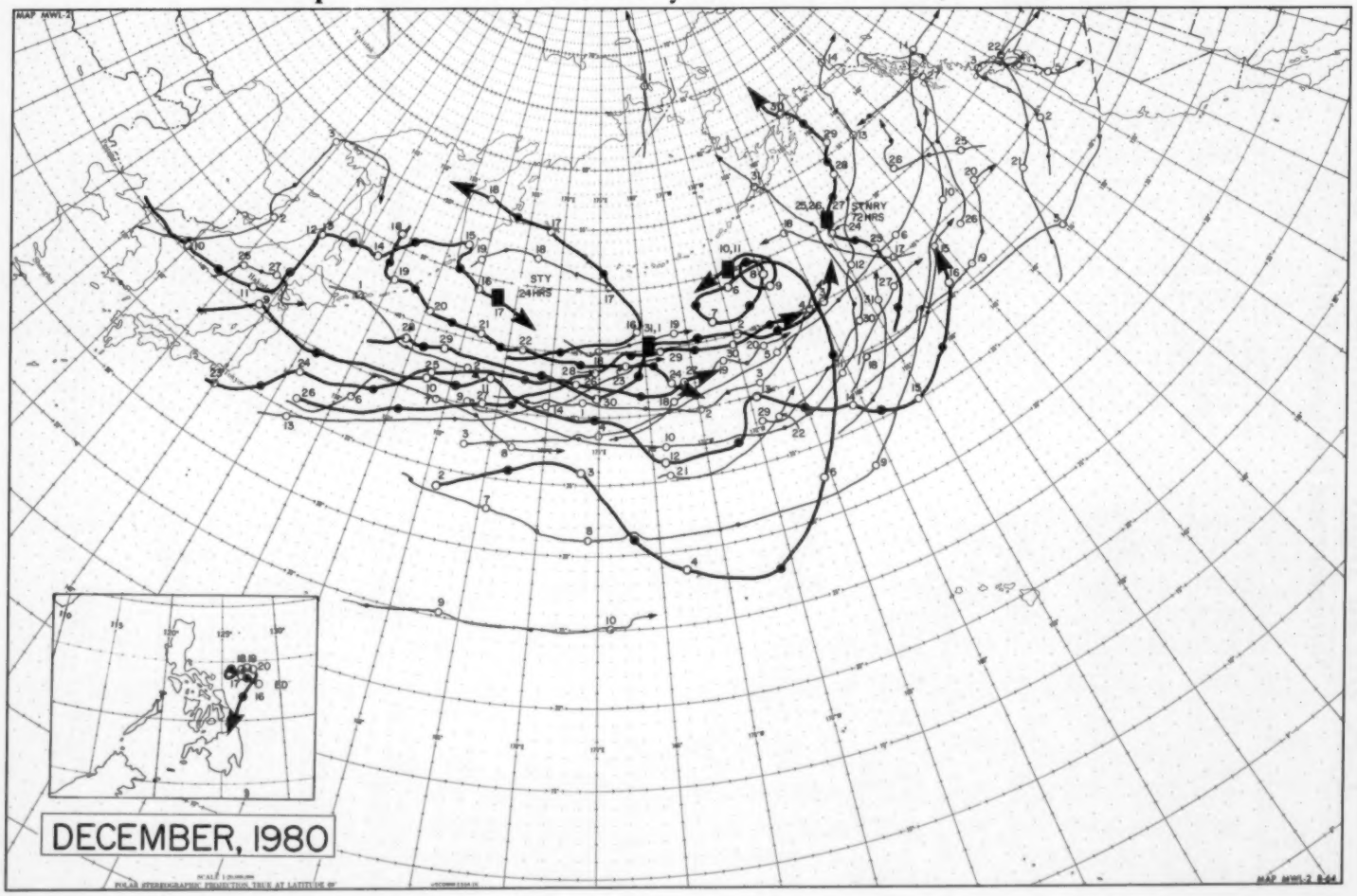


Figure 43. --Open circle indicates 1200 GMT position and closed circle 0000 GMT position. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Smooth Log.

U.S. Ocean Buoy Climatological Data

November and December 1980

NOVEMBER DATA SUMMARY 41001
AVERAGE LATITUDE 34.7N AVERAGE LONGITUDE 072.3W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	04.1	(14 06)	17.2	23.2	(09 18)	177	30
SEA TEMP (DEG C)	19.7	(30 18)	22.0	23.8	(07 18)	182	30
AIR-SEA TEMP (DEG C)	-19.1	(14 06)	-04.8	00.2	(18 12)	177	30
PRESSURE (MBAR)	1003.7	(16 18)	1019.8	1032.2	(23 15)	182	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4-10	11-21	22-33	34-47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		2.2	17.7	6.1	.6		26.5	16.8
NE		2.2	6.1				8.3	12.9
E		3.9	2.2				6.1	10.4
SE	.6	1.7	1.7	1.1			5.0	12.2
S		3.2	6.8	6.1			16.9	19.4
SW			4.4	3.3			7.7	21.5
W		2.2	6.1	4.4	1.1		13.8	19.4
NW		1.1	8.3	7.7	.6		17.7	21.0
CALM								
TOTAL	.6	15.5	53.0	28.7	2.2		100.0	18.3

MAX WIND SPEED: 35 KNOTS DIRECTION: 250 DEG DAY: 22 HOUR: 00

NO. OF OBS: 181

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 180

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	3.3	40.6	28.3	12.8	15.0				2.3M	5.5M (22 06)

DECEMBER DATA SUMMARY 41001
AVERAGE LATITUDE 34.7N AVERAGE LONGITUDE 072.3W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	11.8	(06 00)	15.7	20.0	(09 19)	55	9
SEA TEMP (DEG C)	19.5	(07 06)	20.2	21.0	(02 21)	55	9
AIR-SEA TEMP (DEG C)	-08.3	(03 21)	-04.5	00.8	(09 15)	55	9
PRESSURE (MBAR)	1013.8	(02 09)	1023.0	1027.3	(01 15)	55	9

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4-10	11-21	22-33	34-47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		2.0	13.3	10.3	1.0		26.6	20.9
NE		1.0	4.4				5.4	14.8
E		.5	1.5	2.5	3.4		7.9	29.6
SE		2.0	1.0	1.0			3.9	18.1
S		.5	3.4	1.5			5.4	17.4
SW		1.0	11.8	5.4			18.2	18.7
W		1.5	5.9	3.0			10.3	17.3
NW		1.0	11.8	8.9	.5		22.2	19.9
CALM								
TOTAL		9.4	53.2	32.5	4.9		100.0	19.7

MAX WIND SPEED: 43 KNOTS DIRECTION: 090 DEG DAY: 29 HOUR: 00

NO. OF OBS: 203

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 201

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	1.0	24.4	41.3	18.9	9.5	3.5	1.5		2.6M	6.5M (29 00)

NOVEMBER DATA SUMMARY 41002
AVERAGE LATITUDE 32.3N AVERAGE LONGITUDE 075.3W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	14.0	(12 15)	19.7	24.5	(10 09)	240	30
SEA TEMP (DEG C)	22.2	(30 15)	23.4	25.0	(01 18)	240	30
AIR-SEA TEMP (DEG C)	-09.4	(12 15)	-03.7	00.5	(25 12)	240	30
PRESSURE (MBAR)	1005.7	(18 12)	1017.5	1028.6	(23 15)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4-10	11-21	22-33	34-47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		2.1	10.5	5.9			18.4	18.0
NE		.8	8.4	2.1			11.3	16.1
E	.4	2.1	5.0	1.7			9.2	14.7
SE	.4	2.5	4.2	4.6			10.9	17.5
S	.8	2.1	5.9	1.3	.4		10.5	15.3
SW		2.1	7.1	1.3			10.5	15.1
W	.8	.4	5.0	6.7			13.4	19.6
NW		3.8	9.6	2.5			15.9	14.8
CALM								
TOTAL	2.5	15.5	55.6	25.9	.4		100.0	16.5

MAX WIND SPEED: 35 KNOTS DIRECTION: 160 DEG DAY: 25 HOUR: 03

NO. OF OBS: 239

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 240

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	2.5	44.6	27.5	20.4	5.0				2.1M	8.5M (12 12)

DECEMBER DATA SUMMARY 41002
AVERAGE LATITUDE 32.3N AVERAGE LONGITUDE 075.3W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	07.9	(26 03)	17.9	24.1	(11 03)	246	31
SEA TEMP (DEG C)	21.8	(09 12)	23.4	25.3	(11 06)	246	31
AIR-SEA TEMP (DEG C)	-15.6	(26 03)	-05.5	01.9	(08 15)	246	31
PRESSURE (MBAR)	1000.1	(30 06)	1017.6	1029.9	(22 15)	246	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4-10	11-21	22-33	34-47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	.8	3.7	13.4	8.8			26.4	17.6
NE	.4	2.0	6.1	.4			8.9	14.8
E		.4	.8	1.2	.8		3.3	24.0
SE	.4	2.8	1.6	4.5			9.3	18.2
S		2.0	2.0	.4	.4		4.9	15.0
SW		2.0	11.4	5.7			19.1	18.2
W	.4	3.7	4.1	1.2			11.4	11.5
NW	.8	3.7	8.5	2.0			15.0	14.0
CALM	1.6						1.6	.0
TOTAL	4.5	22.4	48.0	24.0	1.2		100.0	16.1

MAX WIND SPEED: 35 KNOTS DIRECTION: 090 DEG DAY: 28 HOUR: 06

NO. OF OBS: 246

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 246

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	7.7	35.2	26.5	19.9	5.3	3.7	.4		2.2M	8.0M (25 21)

NOVEMBER DATA SUMMARY 41003
AVERAGE LATITUDE 30.3N AVERAGE LONGITUDE 080.4W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	16.5	(29 12)	20.8	25.6	(18 00)	240	30
SEA TEMP (DEG C)	21.4	(30 21)	24.0	26.3	(10 03)	240	30
AIR-SEA TEMP (DEG C)	-11.3	(29 12)	-03.5	01.2	(26 21)	240	30
PRESSURE (MBAR)	1008.7	(16 03)	1018.4	1027.2	(22 15)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4-10	11-21	22-33	34-47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		5.0	14.2	2.1			21.3	15.1
NE	.8	1.3	7.1	1.7			10.8	14.7
E	.4	2.1	13.8				16.3	15.0
SE	.4	.8	2.5				3.8	15.9
S	.8	1.3	4.6	.8			7.5	13.5
SW	.4	1.3	4.2	.4			6.3	12.7
W		1.7	7.5	.4			9.6	15.9
NW	.4	5.0	8.8	3.3			17.5	14.7
CALM	2.5						2.5	.0
TOTAL	5.0	18.3	67.1	8.8			100.0	14.7

MAX WIND SPEED: 27 KNOTS DIRECTION: 300 DEG DAY: 29 HOUR: 12

NO. OF OBS: 240

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 240

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	17.8	49.3	30.7	1.3					1.5M	3.0M (18 03)

DECEMBER DATA SUMMARY 41003
AVERAGE LATITUDE 30.3N AVERAGE LONGITUDE 080.4W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	10.7	(31 15)	22.4	24.6	(08 21)	243	31
SEA TEMP (DEG C)	18.7	(31 15)	22.4	24.6	(12 03)	243	31
AIR-SEA TEMP (DEG C)	-13.2	(25 21)	-05.4	00.8	(10 21)	243	31
PRESSURE (MBAR)	1005.2	(16 21)	1020.1	1028.3	(21 15)	244	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4-10	11-21	22-33	34-47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	.8	8.2	12.3	11.1			32.4	16.6
NE	.8	2.0	4.9	1.2			9.0	13.3
E		2.5	3.3				5.7	11.5
SE		.4	2.0				2.5	13.0
S		.8	2.5				3.3	11.9
SW	.4	2.9	3.7	.4			7.4	12.9
W	.8	5.3	9.0	.4			15.6	11.6
NW	.8	8.1	13.5	2.5			25.0	14.2
CALM	1.2						1.2	.0
TOTAL	4.9	28.3	51.2	15.6			100.0	14.0

MAX WIND SPEED: 30 KNOTS DIRECTION: 330 DEG DAY: 27 HOUR: 00

NO. OF OBS: 244

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 232

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	20.3	53.5	16.0	9.9					1.4M	3.5M (27 03)

NOVEMBER DATA SUMMARY 41004
AVERAGE LATITUDE 32.6N AVERAGE LONGITUDE 078.7W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	09.1	(29 12)	18.2	24.4	(27 15)	240	30
SEA TEMP (DEG C)	21.1	(25 21)	23.5	25.4	(17 18)	240	30
AIR-SEA TEMP (DEG C)	-13.7	(29 12)	-05.3	01.0	(24 09)	240	30
PRESSURE (MBAR)	1008.2	(18 06)	1019.0	1029.8	(22 15)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4-10	11-21	22-33	34-47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	.4	3.3	12.9	5.4			22.1	16.4
NE	.4	2.1	10.8	4.6			17.9	16.3
E	.4	.8	7.5	2.5			11.3	16.0
SE		1.7	4.2	1.7			7.5	15.9
S		2.5	1.7	.4			4.6	11.7
SW		.8	6.3				7.1	13.3
W		1.6	10.0	5.0			20.4	15.2
NW	.4	.8	7.1	.8			9.2	14.5
CALM								
TOTAL	1.7	17.5	68.4	20.4			100.0	15.6

MAX WIND SPEED: 28 KNOTS DIRECTION: 110 DEG DAY: 27 HOUR: 12

NO. OF OBS: 240

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 238

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	8.8	52.5	29.0	9.2	.4				1.6M	4.0M (18 06)

DECEMBER DATA SUMMARY 41004
AVERAGE LATITUDE 32.6N AVERAGE LONGITUDE 078.7W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	03.3	(25 18)	19.4	22.0	(10 06)	246	31
SEA TEMP (DEG C)	18.0	(21 18)	21.1	23.7	(20 09)	246	31
AIR-SEA TEMP (DEG C)	-17.9	(24 03)	-06.6	00.9	(10 03)	246	31
PRESSURE (MBAR)	1000.5	(28 12)	1020.1	1034.0	(21 15)	246	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4-10	11-21	22-33	34-47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	1.8	5.7	12.7	11.4	.9		32.5	17.6
NE	.9	1.3	5.7	8.8			16.7	18.7
E	.4	.9	1.3				2.6	10.9
SE		2.2					2.2	9.6
S	.4	1.8	.4	.4			3.1	10.5
SW		3.2	9.2	1.8			13.2	16.2
W	.9	5.7	12.3	.9			19.7	13.5
NW	.9	4.8	2.2	2.2			10.1	12.1
CALM								
TOTAL	5.3	24.6	43.9	23.4	.9		100.0	15.6

MAX WIND SPEED: 35 KNOTS DIRECTION: 010 DEG DAY: 27 HOUR: 09

NO. OF OBS: 228

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 246

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	21.5	42.3	25.2	8.9	2.0				1.4M	4.0M (29 00)

NOVEMBER DATA SUMMARY 42001

AVERAGE LATITUDE 25.9N AVERAGE LONGITUDE 089.7W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	16.9	(20 03)	22.3	25.8	(03 18)	240	30
SEA TEMP (DEG C)	23.3	(30 12)	24.8	26.2	(19 21)	240	30
AIR-SEA TEMP (DEG C)	-07.2	(20 03)	-02.5	00.4	(23 15)	240	30
PRESSURE (MBAR)	1009.3	(13 09)	1010.1	1025.9	(19 15)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N			2.1	11.7	.8		14.6	15.6
NE		.4	7.9	18.3	5.4	1.3	33.3	15.8
E		1.3	11.7	6.7	2.5	.4	22.5	12.3
SE		.4	2.1	1.7	1.7		5.8	15.1
S		.8	4.2	4.6	.4		10.0	11.9
SW			4.2	.4			4.6	8.4
W			.4	.4			.8	9.0
NW			.8	4.2	3.3		8.3	20.5
CALM								
TOTAL		2.9	33.3	47.9	14.2	1.7	100.0	14.5

NO. OF WAVE OBS: 240

MAX WIND SPEED: 36 KNOTS DIRECTION: 060 DEG DAY: 12 HOUR: 15

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-4.5	4-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	23.8	45.8	17.1	5.4	4.6	3.3			1.7M	6.5M (12 21)

NO. OF WAVE OBS: 240

DECEMBER DATA SUMMARY 42001

AVERAGE LATITUDE 25.9N AVERAGE LONGITUDE 089.7W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	14.7	(26 06)	20.4	24.3	(06 21)	247	31
SEA TEMP (DEG C)	21.6	(31 12)	23.0	23.8	(10 21)	247	31
AIR-SEA TEMP (DEG C)	-08.4	(26 00)	-03.0	01.0	(24 15)	247	31
PRESSURE (MBAR)	1012.3	(16 21)	1021.9	1027.5	(22 03)	247	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N			5.7	15.4	1.4		22.7	14.3
NE			6.9	13.2	4.9		24.7	15.2
E			5.7	17.4	.4		23.5	12.5
SE			3.6	9.3			13.9	12.6
S		.8	2.8	3.2			6.9	9.2
SW			2.8				2.8	6.2
W			.8	.8	.4		2.0	12.2
NW		.8	2.8	.8	.8		5.3	11.1
CALM								
TOTAL		1.6	30.4	54.9	8.1		100.0	13.2

MAX WIND SPEED: 28 KNOTS DIRECTION: 040 DEG DAY: 25 HOUR: 12

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-4.5	4-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	28.1	55.0	16.2	1.7					1.2M	5.5M (25 18)

NO. OF WAVE OBS: 231

NOVEMBER DATA SUMMARY 42002

AVERAGE LATITUDE 26.0N AVERAGE LONGITUDE 093.5W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	15.5	(27 09)	21.9	25.7	(09 18)	240	30
SEA TEMP (DEG C)	23.3	(30 12)	25.0	27.2	(09 21)	240	30
AIR-SEA TEMP (DEG C)	-08.4	(27 09)	-03.1	00.2	(26 06)	240	30
PRESSURE (MBAR)	1000.8	(13 15)	1017.4	1026.8	(19 15)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		.8	2.1	8.0	1.7	.4	13.1	14.9
NE		.4	10.1	17.2	1.7		31.2	12.8
E		.8	9.3	8.3	1.7	.4	19.6	12.1
SE			3.4	1.7	2.1		7.2	14.4
S		.8	4.6	3.8	2.5		11.6	14.1
SW		.4	.4	.4			1.7	9.3
W		.4	1.3	1.7			3.4	11.3
NW		.4	.4	9.3	3.4		13.5	18.7
CALM								
TOTAL		4.2	32.1	49.8	13.1	.8	100.0	13.7

MAX WIND SPEED: 40 KNOTS DIRECTION: 060 DEG DAY: 13 HOUR: 15

NO. OF WAVE OBS: 239

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-4.5	4-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	29.7	38.9	19.2	11.7	4.6	.8			1.6M	7.0M (13 15)

DECEMBER DATA SUMMARY 42002

AVERAGE LATITUDE 26.0N AVERAGE LONGITUDE 093.5W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	14.9	(26 03)	20.4	24.8	(08 21)	244	31
SEA TEMP (DEG C)	21.9	(28 15)	22.7	23.6	(02 21)	244	31
AIR-SEA TEMP (DEG C)	-07.4	(26 03)	-02.3	01.2	(08 15)	244	31
PRESSURE (MBAR)	1013.4	(16 12)	1021.3	1031.1	(25 15)	244	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		.8	9.4	12.3	3.3		25.8	13.6
NE		1.2	4.9	7.8	.8		14.8	11.6
E		.4	8.2	15.2			23.8	11.9
SE		.8	3.7	9.0			13.5	13.2
S		.8	7.8	3.8			12.3	9.9
SW				.4			.4	10.0
W		1.6	.8	.4			2.9	6.0
NW		.8	1.2	3.2			5.3	11.4
CALM		1.2					1.2	.0
TOTAL		7.8	35.2	52.9	4.1		100.0	11.9

MAX WIND SPEED: 27 KNOTS DIRECTION: 010 DEG DAY: 25 HOUR: 08

NO. OF WAVE OBS: 244

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-4.5	4-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	28.6	52.5	18.9	2.0					1.2M	5.5M (25 15)

NOVEMBER DATA SUMMARY 42003

AVERAGE LATITUDE 26.0N AVERAGE LONGITUDE 086.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	18.1	(28 21)	23.5	27.1	(09 18)	240	30
SEA TEMP (DEG C)	26.5	(24 12)	27.5	28.5	(04 18)	240	30
AIR-SEA TEMP (DEG C)	-08.6	(28 21)	-04.0	-00.1	(26 21)	240	30
PRESSURE (MBAR)	1007.6	(11 09)	1016.8	1025.4	(30 15)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N			12.1	14.7			26.8	11.9
NE			7.1	11.7	.8	1.7	21.7	14.4
E		.4	.8	10.8	5.8	7.1	22.9	22.1
SE		.8		4.2	.4		5.0	15.3
S		.4	1.3	.8			2.5	10.7
SW			.8				1.3	4.7
W			3.8	2.9	.4		7.1	11.7
NW		.4	1.3	6.3	1.3		11.3	15.7
CALM								
TOTAL		2.1	27.1	55.4	11.7	9.8	100.0	15.3

NO. OF WAVE OBS: 240

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-4.5	4-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	9.2	36.3	19.6	5.8	8.8	.4			1.8M	6.0M (11 18)

DECEMBER DATA SUMMARY 42003

AVERAGE LATITUDE 26.0N AVERAGE LONGITUDE 086.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	14.6	(28 06)	21.1	25.6	(10 21)	247	31
SEA TEMP (DEG C)	24.6	(31 09)	26.0	27.0	(11 09)	247	31
AIR-SEA TEMP (DEG C)	-10.6	(28 06)	-04.9	-01.1	(10 15)	247	31
PRESSURE (MBAR)	1008.5	(16 21)	1020.0	1025.6	(21 15)	247	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		2.0	6.1	18.6	.8		27.5	13.8
NE		.4	3.1	14.6			18.2	11.9
E		.4	2.8	19.4			22.7	13.2
SE			3.8	2.9			6.9	10.7
S			1.6				1.6	9.8
SW			.4	.4			.8	14.5
W			2.0	2.0	.4		4.5	11.9
NW		.4	3.2	12.1	1.6		17.4	15.3
CALM		.8					.8	.0
TOTAL		4.0	23.5	69.6	2.8		100.0	12.9

MAX WIND SPEED: 27 KNOTS DIRECTION: 300 DEG DAY: 16 HOUR: 21

NO. OF WAVE OBS: 247

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-4.5	4-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	18.2	59.5	20.2	2.0					1.4M	5.0M (25 18)

NOVEMBER DATA SUMMARY 42004

AVERAGE LATITUDE 26.7N AVERAGE LONGITUDE 095.3W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	14.9	(26 15)	23.0	28.0	(04 18)	215	28
SEA TEMP (DEG C)	24.2	(27 09)	25.4	27.7	(10 00)	217	28
AIR-SEA TEMP (DEG C)	-01.5	(11 12)	03.7	07.2	(14 09)	215	28
PRESSURE (MBAR)	1008.5	(16 21)	1019.7	1029.1	(21 18)	216	28

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N			7.0	9.2	.9	1.4	19.3	14.5
NE		1.8	5.4	15.1	2.3		25.7	13.4
E			14.2	5.0	.5		19.7	9.4
SE			2.8				2.8	8.2
S		.5	10.6	4.1			15.1	8.5
SW		.5	3.2	.5			4.1	7.2
W		.5	.9	2.8			4.1	11.5
NW			3.2	3.7	1.9		8.7	15.3
CALM		.5					.5	.0
TOTAL		3.7	49.1	40.4	5.5	1.4	100.0	11.7

MAX WIND SPEED: 27 KNOTS DIRECTION: 350 DEG DAY: 25 HOUR: 03

DECEMBER DATA SUMMARY 42004

AVERAGE LATITUDE 26.7N AVERAGE LONGITUDE 095.3W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	01.9	(25 15)	14.9	24.5	(08 21)	248	31
SEA TEMP (DEG C)	12.9	(31 15)	15.3	17.0	(06 21)	241	31
AIR-SEA TEMP (DEG C)	-12.5	(25 15)	-01.7	10.3	(06 21)	248	31
PRESSURE (MBAR)	1013.1	(08 21)	1022.7	1036.2	(21 15)	221	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		1.2	4.4	14.4	3.7		24.1	15.2
NE		.8	8.3	5.4			14.5	9.8
E			14.5	4.1			18.7	8.8
SE		1.2	7.1	4.8			12.9	8.8
S		1.2	7.3	2.1			10.8	6.1
SW		1.2	3.3	.8			5.4	6.4
W		.8	.8	1.7			3.3	7.7
NW		.4	1.2	5.4			7.1	12.9
CALM		1.7					1.7	.0
TOTAL		8.3	47.3	48.7	3.7		100.0	10.4

MAX WIND SPEED: 24 KNOTS DIRECTION: 340 DEG DAY: 25 HOUR: 02

NOVEMBER DATA SUMMARY 42009

AVERAGE LATITUDE 29.3N AVERAGE LONGITUDE 087.5W

MEANS AND EXTREMES

	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
SEA TEMP (DEG C)	21.9	(20 21)	25.4	29.3	(07 21)	240	30
PRESSURE (MBAR)	1008.7	(26 21)	1018.3	1027.1	(21 15)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	1.7	15.5	11.3				28.5	9.4
NE		4.2	8.8	.4			13.4	12.9
E	.8	4.2	9.6	1.7			16.3	14.0
SE	1.3	5.0	6.7				13.0	11.2
S		2.5	2.5	.4			5.4	11.2
SW	.4	.4					.8	4.5
W	.4	2.5	3.8	.8			7.5	13.4
NW	.4	2.5	10.5	.4			13.8	12.8
CALM	1.3						1.3	.0
TOTAL	6.3	36.8	53.1	3.8			100.0	11.6

NO. OF OBS: 239

MAX WIND SPEED: 26 KNOTS DIRECTION: 260 DEG DAY: 27 HOUR: 03

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 237

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	23.6	45.6	20.7	10.1					1.4M	3.5M	(13 21)

DECEMBER DATA SUMMARY 42009

AVERAGE LATITUDE 29.3N AVERAGE LONGITUDE 087.5W

MEANS AND EXTREMES

	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
SEA TEMP (DEG C)	20.1	(23 00)	21.0	22.7	(02 21)	247	31
PRESSURE (MBAR)	1007.2	(16 21)	1022.2	1031.7	(21 15)	247	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		.4	6.1	20.6	1.6		28.7	13.5
NE		1.2	7.3	7.7			16.2	9.6
E		1.2	5.3	4.5			10.9	8.6
SE		.8	8.5	7.7			17.0	9.8
S		.4	6.1	2.4			10.9	8.8
SW			1.6	.4			2.0	7.6
W		1.6	1.2	2.4			5.3	9.5
NW		.4	4.0	1.6			6.1	10.5
CALM		.8					.8	.0
TOTAL		6.9	42.1	49.4	1.6		100.0	10.5

NO. OF OBS: 247

MAX WIND SPEED: 23 KNOTS DIRECTION: 010 DEG DAY: 03 HOUR: 03

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 245

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	38.6	41.6	6.1	1.6					1.1M	3.5M	(25 12)

NOVEMBER DATA SUMMARY 44003

AVERAGE LATITUDE 40.8N AVERAGE LONGITUDE 068.5W

MEANS AND EXTREMES

	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	03.8	(20 09)	08.8	15.4	(08 12)	240	30
SEA TEMP (DEG C)	10.4	(30 18)	12.2	13.7	(01 18)	240	30
AIR-SEA TEMP (DEG C)	-08.9	(11 06)	-03.4	02.9	(29 03)	240	30
PRESSURE (MBAR)	0991.3	(18 21)	1013.6	1031.0	(03 15)	240	30

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 239

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	1.3	21.8	30.5	24.3	19.2	2.5	.4		2.0M	6.0M	(22 15)

DECEMBER DATA SUMMARY 44003

AVERAGE LATITUDE 40.8N AVERAGE LONGITUDE 068.5W

MEANS AND EXTREMES

	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-08.9	(26 00)	03.7	13.4	(03 06)	247	31
SEA TEMP (DEG C)	06.4	(31 21)	08.5	10.9	(03 15)	247	31
AIR-SEA TEMP (DEG C)	-18.9	(25 21)	-04.7	03.5	(09 09)	247	31
PRESSURE (MBAR)	0993.6	(30 12)	1016.9	1038.6	(22 15)	247	31

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 244

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	2.9	23.8	36.5	19.7	12.7	4.5			2.6M	7.5M	(04 15)

NOVEMBER DATA SUMMARY 44004

AVERAGE LATITUDE 39.0N AVERAGE LONGITUDE 070.0W

MEANS AND EXTREMES

	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	05.4	(11 06)	12.8	20.6	(09 21)	240	30
SEA TEMP (DEG C)	16.6	(30 21)	19.0	21.7	(13 03)	240	30
AIR-SEA TEMP (DEG C)	-14.5	(11 06)	-06.2	01.6	(25 06)	240	30
PRESSURE (MBAR)	0997.9	(18 18)	1017.4	1032.9	(03 15)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		3.3	2.5	2.1	.4		8.3	15.9
NE		.8					.8	7.0
E	.4	.4	2.1	.8			4.2	16.0
SE		.4	3.8	.8			5.0	16.4
S	.8	2.5	3.8	1.3			8.3	12.9
SW	.4	.8	1.7	9.2	.4		12.5	22.8
W	.4	.4	2.9	16.3	.4		20.4	23.9
NW	1.7	1.7	16.7	15.8	4.6		40.4	22.1
CALM								
TOTAL	3.8	10.8	33.3	46.3	5.8		100.0	20.5

NO. OF OBS: 240

MAX WIND SPEED: 42 KNOTS DIRECTION: 320 DEG DAY: 22 HOUR: 12

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 240

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	3.8	22.9	26.7	24.6	19.2	2.9			2.8M	6.5M	(22 18)

DECEMBER DATA SUMMARY 44004

AVERAGE LATITUDE 39.0N AVERAGE LONGITUDE 070.0W

MEANS AND EXTREMES

	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-05.5	(26 00)	08.6	17.8	(09 09)	247	31
SEA TEMP (DEG C)	15.8	(07 21)	17.2	19.0	(08 09)	247	31
AIR-SEA TEMP (DEG C)	-22.5	(26 00)	-08.6	01.7	(09 12)	247	31
PRESSURE (MBAR)	0998.9	(30 09)	1019.7	1040.4	(22 15)	247	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		2.0	5.7	2.4	.8		10.9	18.3
NE	.4	1.2					1.6	6.0
E		1.6	2.4	6.5	.4		10.9	21.7
SE		1.6	1.6				3.2	10.4
S		.8	3.2	2.8	.8		7.7	21.0
SW	.8	.8	6.1	6.1			13.8	19.6
W		3.2	8.5	8.5	3.2		23.4	21.7
NW		4.0	13.8	6.9	3.6		30.4	21.3
CALM								
TOTAL	1.2	15.4	41.3	33.2	8.9		100.0	20.2

NO. OF OBS: 247

MAX WIND SPEED: 44 KNOTS DIRECTION: 290 DEG DAY: 04 HOUR: 03

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 247

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	2.0	24.3	36.4	20.2	11.7	5.3			2.7M	7.0M	(05 00)

% OF OBS WITH POTENTIAL SUPERSTRUCTURE ICING MODERATE: 3.2% SEVERE: NONE #OBS: 247

NOVEMBER DATA SUMMARY 44006

AVERAGE LATITUDE 36.3N AVERAGE LONGITUDE 075.4W

MEANS AND EXTREMES

	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	04.9	(19 15)	11.7	18.8	(10 18)	240	30
SEA TEMP (DEG C)	10.5	(24 21)	14.1	17.2	(08 18)	233	30
AIR-SEA TEMP (DEG C)	-10.0	(11 15)	-02.4	04.4	(24 21)	233	30
PRESSURE (MBAR)	1000.4	(18 09)	1018.4	1031.4	(23 15)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		4.6	13.8	7.9			26.4	17.2
NE	.4	3.3	1.7	.4			5.9	10.4
E		3.8	3.8	.4			7.9	12.5
SE		.8	4.6				5.4	14.8
S		2.1	3.8	1.3			7.1	15.0
SW		2.5	13.0	2.9			18.4	15.4
W		.8	5.9	3.3			10.0	18.1
NW	.8	2.5	6.3	9.2			18.8	19.6
CALM								
TOTAL	1.3	20.8	52.7	25.8			100.0	16.9

NO. OF OBS: 239

MAX WIND SPEED: 32 KNOTS DIRECTION: 320 DEG DAY: 11 HOUR: 06

DECEMBER DATA SUMMARY 44006

AVERAGE LATITUDE 36.3N AVERAGE LONGITUDE 075.4W

MEANS AND EXTREMES

	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-05.9	(25 18)	07.5	14.5	(28 15)	247	31
SEA TEMP (DEG C)	07.3	(24 09)	10.0	11.7	(01 21)	247	31
AIR-SEA TEMP (DEG C)	-16.7	(25 18)	-02.4	04.1	(28 15)	247	31
PRESSURE (MBAR)	1004.8	(29 21)	1020.2	1038.8	(21 15)	247	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		.4	2.0	24.3	10.5	.4	37.7	18.5
NE			.4	5.3	3.6		9.3	18.9
E			.4	2.8	.8		4.0	15.9
SE				1.2			1.2	14.7
S			2.8	6.9			8.9	14.0
SW		.4	4.0	13.0	.4		17.8	14.6
W		1.6	2.8	2.8	.4		7.7	9.0
NW		.8	1.6	6.1	3.6	.8	13.0	19.0
CALM		.4					.4	.0
TOTAL		3.6	13.4	62.3	19.4	1.2	100.0	16.6

NO. OF OBS: 247

MAX WIND SPEED: 38 KNOTS DIRECTION: 330 DEG DAY: 25 HOUR: 09

% OF OBS WITH POTENTIAL SUPERSTRUCTURE ICING MODERATE: 4.5% SEVERE: NONE #OBS: 247

NOVEMBER DATA SUMMARY 45002
AVERAGE LATITUDE 45.3N AVERAGE LONGITUDE 066.3W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-02.1	(18 18)	07.7	00.6	(03 18)	240	30
SEA TEMP (DEG C)	05.3	(27 21)	08.4	07.9	(01 00)	240	30
AIR-SEA TEMP (DEG C)	-06.7	(10 15)	-03.8	01.2	(03 18)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		4.6	22.9	2.1			29.6	10.4
NE	.8	1.3	4.6	.4			7.1	13.4
E	.4	.4	1.7				2.5	12.8
SE	.4	.4	.4				1.3	7.7
S		.4	7.9	1.3			9.6	16.2
SW	.8	2.5	13.3	2.1			18.3	15.4
W	.8	4.2	10.8	.4			15.0	13.3
NW		4.6	9.6	2.1			16.3	15.3
CALM	.4						.4	.0
TOTAL	2.9	19.3	70.4	8.3			100.0	14.8

NO. OF OBS: 240
MAX WIND SPEED: 27 KNOTS DIRECTION: 300 DEG DAY: 22 HOUR: 21

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	16.3	62.5	15.0	6.2					1.3M	3.5M	(23 03)

NO. OF WAVE OBS: 240

DECEMBER DATA SUMMARY 45002
AVERAGE LATITUDE 45.3N AVERAGE LONGITUDE 066.3W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-07.7	(03 12)	-02.0	04.4	(01 03)	30	4
SEA TEMP (DEG C)	04.8	(04 15)	05.0	05.4	(01 09)	30	4
AIR-SEA TEMP (DEG C)	-12.6	(03 12)	-07.0	-01.0	(01 03)	30	4

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N			3.3	13.3	16.7		33.3	20.3
NE			6.7	10.0	6.7		23.3	18.4
E								
SE			10.0	6.7			16.7	8.4
S			3.3	10.0			13.3	12.0
SW								
W				6.7			6.7	14.0
NW			6.7				6.7	10.0
CALM								
TOTAL			30.0	46.7	23.3		100.0	15.7

NO. OF OBS: 30
MAX WIND SPEED: 31 KNOTS DIRECTION: 010 DEG DAY: 02 HOUR: 15

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	20.0	56.7	10.0	13.3					1.5M	3.5M	(03 00)

NO. OF WAVE OBS: 30

% OF OBS WITH POTENTIAL SUPERSTRUCTURE ICING MODERATE:40.0% SEVERE: NONE #OBS: 30

NOVEMBER DATA SUMMARY 45003
AVERAGE LATITUDE 45.3N AVERAGE LONGITUDE 052.9W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-03.3	(18 15)	02.9	09.7	(04 03)	239	30
SEA TEMP (DEG C)	04.9	(30 21)	05.9	07.5	(02 00)	237	30
AIR-SEA TEMP (DEG C)	-08.8	(18 18)	-03.0	02.4	(04 03)	237	30
PRESSURE (MBAR)	0990.2	(29 06)	1016.2	1031.6	(16 15)	239	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		3.3	13.8	.4			17.6	14.4
NE	.4	.4	.4				1.3	9.3
E	.4		2.5	.4			3.3	16.6
SE	.4	.4	1.7	.4			2.9	11.6
S	1.7	1.7	10.5	.4			14.2	14.8
SW		3.4	14.2	2.1			20.1	14.6
W	.8	3.3	10.0	4.6			18.8	16.1
NW	.4	3.8	10.5	6.7			21.3	16.8
CALM								
TOTAL	4.2	16.7	64.0	15.1			100.0	15.2

NO. OF OBS: 239
MAX WIND SPEED: 29 KNOTS DIRECTION: 300 DEG DAY: 30 HOUR: 08

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	15.2	52.6	27.0	5.2					1.5M	3.5M	(17 00)

NO. OF WAVE OBS: 230

% OF OBS WITH POTENTIAL SUPERSTRUCTURE ICING MODERATE: 5.0% SEVERE: NONE #OBS: 239

DECEMBER DATA SUMMARY 45003
AVERAGE LATITUDE 45.3N AVERAGE LONGITUDE 052.9W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-11.1	(03 12)	-02.0	08.3	(01 00)	24	3
SEA TEMP (DEG C)	04.8	(03 12)	04.8	05.0	(01 21)	24	3
AIR-SEA TEMP (DEG C)	-15.6	(03 12)	-06.8	00.4	(01 00)	24	3
PRESSURE (MBAR)	1001.6	(01 00)	1017.6	1037.1	(03 18)	24	3

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		16.7	16.7	20.8			54.2	16.5
NE			8.3				8.3	20.0
E								
SE								
S								
SW			8.3				8.3	15.0
W		4.2	4.2				8.3	11.5
NW		12.5		8.3			20.8	14.8
CALM								
TOTAL		33.3	37.5	29.2			100.0	15.9

NO. OF OBS: 24
MAX WIND SPEED: 31 KNOTS DIRECTION: 350 DEG DAY: 02 HOUR: 21

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	23.8	47.6	23.8	4.8					1.4M	3.0M	(03 03)

NO. OF WAVE OBS: 23

% OF OBS WITH POTENTIAL SUPERSTRUCTURE ICING MODERATE:33.3% SEVERE: NONE #OBS: 24

NOVEMBER DATA SUMMARY 45005
AVERAGE LATITUDE 41.7N AVERAGE LONGITUDE 052.5W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	00.3	(11 15)	04.9	14.6	(04 03)	240	30
SEA TEMP (DEG C)	04.6	(30 21)	07.0	09.5	(02 21)	240	30
AIR-SEA TEMP (DEG C)	-07.4	(11 15)	-02.1	05.7	(04 03)	240	30
PRESSURE (MBAR)	0996.6	(07 21)	1018.7	1034.4	(26 15)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		3.8	12.5				16.6	12.5
NE	.8	1.3	1.3				3.3	8.5
E	.4	3.8	2.1				6.3	11.7
SE	.4	.4	2.1				2.9	12.9
S	.4	2.5	9.2				12.1	12.1
SW	.8	5.4	17.5	.8			24.6	12.7
W	.4	4.6	11.7	.4			17.1	12.7
NW	.8	5.4	11.3				17.5	10.7
CALM	.4						.4	.0
TOTAL	4.6	27.1	67.1	1.3			100.0	11.9

NO. OF OBS: 240
MAX WIND SPEED: 25 KNOTS DIRECTION: 260 DEG DAY: 29 HOUR: 03

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	42.0	55.5	2.5						.8M	2.0M	(20 06)

NO. OF WAVE OBS: 238

DECEMBER DATA SUMMARY 45005
AVERAGE LATITUDE 41.7N AVERAGE LONGITUDE 052.5W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-07.0	(03 12)	03.5	08.3	(08 12)	62	8
SEA TEMP (DEG C)	03.2	(06 09)	03.8	04.9	(01 21)	62	8
AIR-SEA TEMP (DEG C)	-10.6	(03 12)	-00.3	04.9	(08 12)	62	8
PRESSURE (MBAR)	1002.4	(02 18)	1021.1	1038.7	(04 00)	62	8

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	1.6						1.6	3.0
NE	1.6						1.6	3.0
E		19.4	3.2				22.6	8.6
SE		14.5					14.5	6.2
S	1.6	14.5	3.2				19.4	7.8
SW	1.6	12.9	9.7				24.2	9.7
W			1.6	1.6			3.2	18.0
NW	1.6	3.2	4.8	3.2			12.9	14.0
CALM								
TOTAL	8.1	64.5	22.6	4.8			100.0	9.5

NO. OF OBS: 62
MAX WIND SPEED: 24 KNOTS DIRECTION: 310 DEG DAY: 03 HOUR: 03

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	62.9	30.6	6.5						.7M	2.0M	(03 06)

NO. OF WAVE OBS: 62

% OF OBS WITH POTENTIAL SUPERSTRUCTURE ICING MODERATE: 6.5% SEVERE: NONE #OBS: 62

NOVEMBER DATA SUMMARY 46001
AVERAGE LATITUDE 56.0N AVERAGE LONGITUDE 146.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	01.9	(27 21)	05.6	09.3	(04 00)	240	30
SEA TEMP (DEG C)	05.6	(30 21)	06.0	08.0	(01 09)	240	30
AIR-SEA TEMP (DEG C)	-04.6	(08 15)	-01.3	00.8	(04 03)	240	30
PRESSURE (MBAR)	0983.6	(27 00)	0996.2	1022.9	(30 21)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N			2.5	.8			3.3	17.8
NE		.4	2.1	2.9			5.4	21.1
E	.4	2.5	3.3	1.3			7.5	19.0
SE		2.5	7.9	4.6			15.8	17.0
S	.8	4.6	10.3	2.5			20.2	14.8
SW		1.3	10.4	5.0			16.7	17.4
W	.4	.8	11.3	5.0			17.5	18.2
NW		1.7	4.3	.8	.8		9.6	17.0
CALM								
TOTAL	1.7	14.6	60.0	22.9	.8		100.0	16.0

NO. OF OBS: 240
MAX WIND SPEED: 36 KNOTS DIRECTION: 300 DEG DAY: 27 HOUR: 03

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY		10.0	23.7	27.9	32.9	7.1	.4		3.3M	6.0M	(25 12)

NO. OF WAVE OBS: 225

DECEMBER DATA SUMMARY 46001
AVERAGE LATITUDE 56.0N AVERAGE LONGITUDE 146.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-04.5	(15 06)	02.5	09.6	(31 12)	247	31
SEA TEMP (DEG C)	04.0	(30 18)	04.8	06.7	(02 09)	247	31
AIR-SEA TEMP (DEG C)	-09.4	(14 09)	-02.2	02.6	(31 12)	247	31
PRESSURE (MBAR)	0988.0	(13 15)	1007.0	1034.3	(17 12)	247	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	SPEED (KNOTS) <4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	.8	4.0	6.1	.8			11.7	11.9
NE	.4	.8	21.9	4.3			28.3	17.3
E		.4	8.1	4.0			12.6	16.9
SE		.4	3.6	1.6			5.1	15.9
S	.4	2.8	2.4				5.7	10.2
SW		.8	3.2	5.3			9.3	20.3
W		2.0	13.0	5.3			20.2	17.6
NW		1.2	4.5	.4			6.1	14.8
CALM								
TOTAL	2.0	12.6	62.8	22.7			100.0	16.6

NO. OF OBS: 247
MAX WIND SPEED: 38 KNOTS DIRECTION: 050 DEG DAY: 24 HOUR: 06

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS)

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY	1.8	7.6	43.1	29.3	15.1	3.1			2.9M	7.0M	(20 09)

NO. OF WAVE OBS: 225

% OF OBS WITH POTENTIAL SUPERSTRUCTURE ICING MODERATE: 7.3% SEVERE: NONE #OBS: 247

NOVEMBER DATA SUMMARY 46002
AVERAGE LATITUDE 42.5N AVERAGE LONGITUDE 130.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	08.2	(29 21)	13.9	17.3	(03 09)	239	30
SEA TEMP (DEG C)	13.7	(30 21)	14.9	16.1	(05 18)	239	30
AIR-SEA TEMP (DEG C)	-05.7	(29 21)	-01.0	01.4	(03 09)	239	30
PRESSURE (MBAR)	0999.7	(01 00)	1018.9	1033.6	(15 06)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

	SPEED (KNOTS)					TOTAL	MEAN SPEED	NO. OF OBS: 240
DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	%	(KNOTS)
N	.4	.8	1.3				2.5	11.4
NE		2.1	.8				2.9	8.7
E		2.9	.4				3.3	7.2
SE		1.7	1.3	.4			3.3	13.9
S	1.3	5.4	20.4	6.3			33.3	16.4
SW	.8	4.6	12.9	6.3			24.2	16.4
W	.4	4.2	12.1	2.5			19.2	14.9
NW	.8	1.3	5.8	1.3			11.3	12.6
CALM								
TOTAL	3.3	25.0	59.0	16.7			100.0	14.9

MAX WIND SPEED: 32 KNOTS DIRECTION: 240 DEG DAY: 07 HOUR: 18

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 240

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY		3.8	23.8	35.8	32.5	2.1	1.7	.4	3.5M	10.5M	(08 03)

DECEMBER DATA SUMMARY 46002
AVERAGE LATITUDE 42.5N AVERAGE LONGITUDE 130.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	07.3	(04 03)	12.4	15.4	(25 00)	247	31
SEA TEMP (DEG C)	12.7	(31 15)	13.1	13.7	(03 00)	247	31
AIR-SEA TEMP (DEG C)	-06.1	(04 03)	-00.7	02.3	(25 00)	247	31
PRESSURE (MBAR)	0989.7	(02 15)	1016.1	1032.0	(15 09)	247	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

	SPEED (KNOTS)					TOTAL	MEAN SPEED	NO. OF OBS: 247
DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	%	(KNOTS)
N		.4	2.8	5.3			8.5	12.3
NE		.4	1.6	2.4	.4		4.9	13.0
E		.4	2.8	3.6	.4		7.3	11.4
SE		.4	1.6	4.0	.8		6.9	13.2
S		1.6	8.5	28.1	6.9		45.1	15.2
SW		.4	2.8	7.7	.8	.4	12.1	14.9
W			1.6	3.2	.8	.4	6.1	17.1
NW			1.2	6.9	2.8		10.9	17.8
CALM	1.2						1.2	
TOTAL	1.2	4.9	23.1	58.3	13.0	.8	100.0	14.6

MAX WIND SPEED: 41 KNOTS DIRECTION: 230 DEG DAY: 21 HOUR: 18

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 245

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY			17.1	31.0	38.7	10.6	3.3	.4	2.9M	8.5M	(21 21)

NOVEMBER DATA SUMMARY 46003
AVERAGE LATITUDE 52.0N AVERAGE LONGITUDE 156.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	00.0	(27 15)	04.1	07.2	(04 21)	239	30
SEA TEMP (DEG C)	05.1	(29 12)	06.8	07.9	(02 03)	240	30
AIR-SEA TEMP (DEG C)	-06.2	(19 15)	-02.7	-00.3	(04 21)	239	30
PRESSURE (MBAR)	0974.8	(24 09)	0997.6	1025.9	(29 06)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

	SPEED (KNOTS)					TOTAL	MEAN SPEED	NO. OF OBS: 239
DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	%	(KNOTS)
N	.8	.8	4.2	5.9	.4		12.1	20.2
NE	.4	.4	2.5				3.3	13.4
E		.4	1.3	.4			2.1	17.8
SE		.4	.8	3.8			5.0	22.9
S		2.1	3.3	7.5	.4		13.4	21.1
SW		1.3	8.8	10.5	3.3		23.8	23.8
W		1.7	14.2	10.5	1.7		28.0	21.4
NW			3.8	8.4			12.1	24.4
CALM								
TOTAL	1.3	7.1	38.9	46.9	5.9		100.0	21.9

MAX WIND SPEED: 41 KNOTS DIRECTION: 230 DEG DAY: 17 HOUR: 18

DECEMBER DATA SUMMARY 46003
AVERAGE LATITUDE 52.0N AVERAGE LONGITUDE 156.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-04.1	(13 21)	03.6	06.7	(06 12)	225	29
SEA TEMP (DEG C)	04.7	(16 09)	05.3	05.8	(12 03)	247	31
AIR-SEA TEMP (DEG C)	-09.1	(13 21)	-01.7	01.0	(06 12)	225	29
PRESSURE (MBAR)	0976.0	(31 03)	1003.2	1036.6	(16 21)	247	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

	SPEED (KNOTS)					TOTAL	MEAN SPEED	NO. OF OBS: 247
DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	%	(KNOTS)
N			2.0	3.2	1.6		6.9	26.3
NE		1.2	3.2	3.6	1.2		9.3	21.8
E		.4	10.9	13.0	5.3		29.6	24.0
SE	.8	3.6	11.7	4.9	.4		21.5	16.7
S		2.0	7.3	2.8			12.1	17.2
SW		1.6	4.0	1.2			6.9	15.4
W	.4	.8	2.8				4.0	12.6
NW	.4		1.6	1.6			3.6	18.6
CALM								
TOTAL	1.6	9.7	43.7	28.3	16.6		100.0	21.7

MAX WIND SPEED: 47 KNOTS DIRECTION: 250 DEG DAY: 23 HOUR: 15

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 237

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY			6.8	30.0	26.6	24.2	5.9	3.0	3.7M	10.5M	(23 21)

% OF OBS WITH POTENTIAL SUPERSTRUCTURE ICING MODERATE: 4.48 SEVERE: NONE OBS: 225

NOVEMBER DATA SUMMARY 46004
AVERAGE LATITUDE 51.0N AVERAGE LONGITUDE 136.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	04.9	(29 12)	09.1	12.9	(03 12)	240	30
SEA TEMP (DEG C)	08.5	(30 21)	10.0	11.1	(01 00)	240	30
AIR-SEA TEMP (DEG C)	-03.7	(29 12)	-00.9	02.4	(26 18)	240	30
PRESSURE (MBAR)	0979.0	(07 03)	1008.0	1026.7	(14 21)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

	SPEED (KNOTS)					TOTAL	MEAN SPEED	NO. OF OBS: 240
DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	%	(KNOTS)
N	.4	1.3	2.5	2.5			6.7	16.8
NE			1.3	.4			1.7	16.3
E		1.3					1.3	7.0
SE		.4	.8	1.3	1.7		4.2	28.2
S		.8	7.5	12.5	5.0		25.8	25.9
SW		2.5	10.4	9.2	1.7	.4	24.2	21.8
W		3.8	15.4	6.7	.4		26.3	17.7
NW			.8	3.8	5.4		10.0	20.3
CALM								
TOTAL	.4	10.8	41.7	37.9	8.8	.4	100.0	21.0

MAX WIND SPEED: 48 KNOTS DIRECTION: 210 DEG DAY: 27 HOUR: 00

DECEMBER DATA SUMMARY 46004
AVERAGE LATITUDE 51.0N AVERAGE LONGITUDE 136.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	01.8	(02 12)	06.6	10.9	(15 00)	247	31
SEA TEMP (DEG C)	07.1	(23 06)	07.7	08.5	(01 00)	247	31
AIR-SEA TEMP (DEG C)	-06.4	(02 12)	-01.1	03.0	(15 00)	247	31
PRESSURE (MBAR)	0978.9	(27 00)	1009.9	1034.6	(17 09)	247	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

	SPEED (KNOTS)					TOTAL	MEAN SPEED	NO. OF OBS: 247
DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	%	(KNOTS)
N	.8	1.2	4.9	13.8	.4		21.1	22.3
NE	.4	1.2	3.2	2.4			7.3	17.0
E	.4	2.8	4.9	5.3	.4		13.8	18.7
SE		1.2	5.3	4.9	.4		11.7	20.9
S		1.6	8.5	8.9	.4		19.4	20.7
SW	.4	.8	2.2	9.7	1.6		15.8	24.0
W	.4		2.4	2.4			5.3	20.4
NW		1.2	3.2	.8			5.3	14.8
CALM	.4						.4	.0
TOTAL	2.8	10.1	35.6	48.2	3.2		100.0	20.6

MAX WIND SPEED: 38 KNOTS DIRECTION: 240 DEG DAY: 27 HOUR: 09

NOVEMBER DATA SUMMARY 46005
AVERAGE LATITUDE 46.0N AVERAGE LONGITUDE 131.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	06.6	(29 21)	12.0	15.5	(04 21)	239	30
SEA TEMP (DEG C)	10.9	(30 21)	13.1	14.3	(01 03)	240	30
AIR-SEA TEMP (DEG C)	-05.5	(29 21)	-01.1	01.6	(26 21)	239	30
PRESSURE (MBAR)	0983.7	(01 00)	1013.7	1032.4	(15 06)	240	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

	SPEED (KNOTS)					TOTAL	MEAN SPEED	NO. OF OBS: 240
DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	%	(KNOTS)
N		.4	2.1	1.3			3.8	16.8
NE		.8	1.7	1.3			3.8	16.4
E	1.3	.4		.4			2.1	8.0
SE	.4	1.3	2.5	1.7			5.8	16.4
S		2.5	14.6	12.9	.4		30.4	20.6
SW	1.3	2.1	12.1	5.4	.4		21.3	17.5
W		1.7	11.7	9.2			22.5	19.9
NW	.8	2.5	6.3	.8			10.4	13.2
CALM								
TOTAL	3.8	11.7	50.8	32.9	.8		100.0	18.3

MAX WIND SPEED: 40 KNOTS DIRECTION: 200 DEG DAY: 01 HOUR: 00

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 240

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY			18.8	39.2	34.6	5.8	1.7		3.5M	9.0M	(08 03)

DECEMBER DATA SUMMARY 46005
AVERAGE LATITUDE 46.0N AVERAGE LONGITUDE 131.0W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	05.3	(03 18)	10.2	13.6	(26 06)	247	31
SEA TEMP (DEG C)	10.4	(31 06)	11.0	11.9	(01 06)	247	31
AIR-SEA TEMP (DEG C)	-04.4	(03 18)	-00.8	02.6	(26 00)	247	31
PRESSURE (MBAR)	0990.1	(21 18)	1012.4	1027.9	(07 18)	247	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

	SPEED (KNOTS)					TOTAL	MEAN SPEED	NO. OF OBS: 123
DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	%	(KNOTS)
N			1.6	4.1	3.3		8.9	17.1
NE			.8	1.6	.8		3.3	16.8
E		.8		7.3		.8	9.8	16.8
SE								
S		.8	2.4	20.3	12.2		35.8	18.4
SW			2.4	8.9	3.3		14.6	16.8
W			.8	8.1			8.9	15.8
NW				6.5	12.2		18.7	22.8
CALM								
TOTAL	1.6	0.9	56.9	31.7	.8		100.0	18.5

MAX WIND SPEED: 37 KNOTS DIRECTION: 080 DEG DAY: 13 HOUR: 03

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 247

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX	(DA HR)
% FREQUENCY			10.5	35.6	29.1	24.3	.4		3.0M	6.0M	(26 18)

NOVEMBER DATA SUMMARY 46011

AVERAGE LATITUDE 34.9N AVERAGE LONGITUDE 120.9W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	11.7	(17 12)	14.2	17.5	(03 21)	239	30
SEA TEMP (DEG C)	13.0	(26 09)	14.6	16.9	(01 21)	239	30
AIR-SEA TEMP (DEG C)	-02.9	(07 21)	-00.4	02.0	(27 21)	239	30
PRESSURE (MBAR)	1010.2	(10 03)	1018.8	1026.6	(25 18)	239	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	1.3	13.4	16.3				31.0	10.9
NE	1.7	5.0	.8				7.5	6.6
E	2.9	.8	.4				4.2	3.6
SE	2.5	1.7					4.2	3.6
S	.8	.8					1.7	3.5
SW	.4	.8					1.3	3.3
W	.8	1.3	.4				2.5	5.4
NW	2.9	11.7	29.5	2.1			45.2	12.7
CALM	2.1						2.1	.0
TOTAL	15.5	36.0	46.0	2.1			100.0	10.2

NO. OF OBS: 239

MAX WIND SPEED: 23 KNOTS DIRECTION: 330 DEG DAY: 15 HOUR: 00

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 238

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	.8	28.2	54.2	12.6	4.2				2.1M	5.0M (09 09)

DECEMBER DATA SUMMARY 46011

AVERAGE LATITUDE 34.9N AVERAGE LONGITUDE 120.9W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	10.3	(07 18)	14.1	19.4	(31 21)	245	31
SEA TEMP (DEG C)	11.8	(06 15)	14.3	18.9	(26 21)	245	31
AIR-SEA TEMP (DEG C)	-04.4	(07 18)	-00.4	03.9	(31 21)	245	31
PRESSURE (MBAR)	1008.1	(04 03)	1018.3	1026.4	(10 18)	245	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	2.9	13.5	13.5				29.8	9.6
NE	2.0	4.5	3.7	.4			10.6	6.6
E	4.1	2.0	.8				7.0	4.8
SE	2.9	5.7	.4	1.2			9.8	7.8
S	.4	1.2	2.8	.8			5.5	12.7
SW		.4					.5	9.2
W	1.6	3.7					5.3	5.6
NW	1.6	10.2	16.7				28.5	11.2
CALM	3.3						3.3	.0
TOTAL	19.4	42.0	37.1	2.4			100.0	9.8

NO. OF OBS: 245

MAX WIND SPEED: 30 KNOTS DIRECTION: 150 DEG DAY: 04 HOUR: 03

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 243

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	2.5	59.3	33.3	4.9					1.6M	3.5M (04 09)

NOVEMBER DATA SUMMARY 45001

AVERAGE LATITUDE 48.0N AVERAGE LONGITUDE 087.6W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-04.7	(10 06)	01.1	06.9	(23 03)	195	25
SEA TEMP (DEG C)	03.1	(25 12)	03.8	05.9	(04 15)	195	25
AIR-SEA TEMP (DEG C)	-09.2	(10 06)	-02.3	03.6	(23 03)	195	25
PRESSURE (MBAR)	0990.8	(09 09)	1017.1	1035.8	(11 15)	195	25

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	1.0	9.7	23.0	.8			33.2	13.2
NE	1.0	3.6	1.5				6.2	7.7
E	.5	.5					1.0	3.6
SE		1.0	3.1				4.1	13.3
S	1.0	9.1	12.2				19.4	11.4
SW		2.0	5.6				7.7	12.2
W	1.5	2.6	8.2				12.2	11.1
NW	.8	3.1	11.7	1.0			16.3	14.2
CALM								
TOTAL	5.6	27.6	65.3	1.9			100.0	12.2

NO. OF OBS: 196

MAX WIND SPEED: 23 KNOTS DIRECTION: 320 DEG DAY: 01 HOUR: 03

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 186

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	10.1	60.2	19.9	3.8					1.3M	3.5M (09 03)

DECEMBER DATA SUMMARY 45001

AVERAGE LATITUDE 31.7N AVERAGE LONGITUDE 079.7W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	05.4	(25 18)	15.3	23.2	(18 03)	209	27
SEA TEMP (DEG C)	19.1	(20 21)	22.6	28.2	(16 06)	209	27
AIR-SEA TEMP (DEG C)	-17.5	(25 18)	-07.3	00.3	(10 21)	209	27
PRESSURE (MBAR)	1006.0	(16 21)	1019.7	1032.1	(21 15)	209	27

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	2.9	11.0	14.3	6.2			34.9	13.6
NE	.5	2.4	9.0	2.4			14.2	13.2
E			.5				.5	11.0
SE		.5	.5				1.0	10.0
S				.5			.5	22.0
SW		1.9	4.8	.5			7.2	13.3
W		11.0	12.0				23.0	11.4
NW	.5	4.8	11.0	.5			16.7	12.9
CALM	.5						.5	.0
TOTAL	3.8	31.4	54.5	10.0			100.0	13.4

NO. OF OBS: 209

MAX WIND SPEED: 27 KNOTS DIRECTION: 360 DEG DAY: 27 HOUR: 06

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 209

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	6.2	49.3	22.5	20.1	1.9				1.8M	4.9M (29 12)

NOVEMBER DATA SUMMARY 45004

AVERAGE LATITUDE 47.2N AVERAGE LONGITUDE 086.5W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-03.4	(10 09)	01.9	07.1	(22 21)	197	25
SEA TEMP (DEG C)	04.5	(21 15)	04.6	05.3	(06 21)	196	25
AIR-SEA TEMP (DEG C)	-08.0	(10 09)	-02.7	30.5	(25 12)	197	25
PRESSURE (MBAR)	0990.6	(09 09)	1016.8	1035.1	(11 15)	197	25

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	1.0	9.6	17.3	.5			28.4	11.6
NE	.5	.5	.5				1.5	7.7
E								
SE	1.0	1.5	3.6				6.1	10.7
S	.5	1.5	12.2				14.2	13.5
SW	.5	3.0	8.1	.5			12.2	13.0
W	.5	2.5	6.1				9.1	12.1
NW	.5	7.1	19.3	1.5			28.4	13.7
CALM								
TOTAL	4.6	25.9	67.0	2.5			100.0	12.6

NO. OF OBS: 197

% OF OBS WITH POTENTIAL SUPERSTRUCTURE ICING MODERATE: 4.1% SEVERE: NONE #OBS: 197

DECEMBER DATA SUMMARY 44004

AVERAGE LATITUDE 42.7N AVERAGE LONGITUDE 068.3W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	-13.8	(26 00)	00.3	11.2	(03 09)	233	30
SEA TEMP (DEG C)	09.9	(28 12)	07.2	08.4	(03 09)	233	30
AIR-SEA TEMP (DEG C)	-20.3	(26 00)	-06.9	02.9	(03 09)	233	30
PRESSURE (MBAR)	0997.8	(03 18)	1016.2	1039.0	(28 06)	234	30

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		3.4	6.4	4.7	2.6		17.1	21.3
NE		.9	1.3	.9			3.0	16.1
E		.4	2.6		.4		3.4	18.1
SE		.9	3.4	1.7			6.0	17.6
S		1.7	4.7	2.1			8.1	16.8
SW		2.6	7.3	3.8			13.9	16.4
W	1.3	3.8	8.1	5.6	.9		19.7	16.9
NW		4.3	10.7	12.8	2.1		29.9	21.0
CALM								
TOTAL	1.3	17.5	44.4	30.8	6.0		100.0	18.9

NO. OF OBS: 234

MAX WIND SPEED: 39 KNOTS DIRECTION: 340 DEG DAY: 05 HOUR: 03

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 233

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	9.0	30.6	25.3	19.6	12.0	.4			2.1M	6.9M (05 03)

% OF OBS WITH POTENTIAL SUPERSTRUCTURE ICING MODERATE:20.2% SEVERE: 1.7% #OBS: 233

DECEMBER DATA SUMMARY 46012

AVERAGE LATITUDE 37.4N AVERAGE LONGITUDE 122.7W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	09.2	(08 15)	12.7	17.8	(15 18)	244	31
SEA TEMP (DEG C)	11.7	(02 03)	12.7	13.3	(30 21)	244	31
AIR-SEA TEMP (DEG C)	-03.6	(08 15)	00.0	05.1	(15 18)	244	31
PRESSURE (MBAR)	0999.6	(04 00)	1020.2	1029.6	(10 18)	244	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N	4.5	16.4	8.6				29.5	7.7
NE	2.0	5.7	5.7				13.5	9.1
E	1.6	5.7	.4				7.8	8.4
SE	.4	3.3	.8	.4			4.9	8.7
S	1.2	2.9	4.1	3.3			11.5	15.2
SW	.4	.8	.4				1.6	9.0
W	2.5	2.9					5.3	3.9
NW	2.5	13.9	6.6				23.0	8.3
CALM	1.6						1.6	.0
TOTAL	18.0	53.7	26.6	3.7			100.0	8.4

NO. OF OBS: 244

MAX WIND SPEED: 32 KNOTS DIRECTION: 170 DEG DAY: 04 HOUR: 08

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 244

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	2.0	54.5	25.8	15.6	2.0				1.5M	5.0M (04 00)

DECEMBER DATA SUMMARY 46010

AVERAGE LATITUDE 48.2N AVERAGE LONGITUDE 124.2W

MEANS AND EXTREMES	MIN	(DA HR)	MEAN	MAX	(DA HR)	NO. OF OBS	DAYS WITH DATA
AIR TEMP (DEG C)	00.8	(07 15)	08.7	12.8	(27 00)	245	31
SEA TEMP (DEG C)	07.3	(09 00)	10.6	11.8	(03 00)	245	31
AIR-SEA TEMP (DEG C)	-08.7	(07 12)	-01.9	02.0	(26 10)	245	31
PRESSURE (MBAR)	0982.7	(02 18)	1017.5	1039.8	(16 12)	245	31

WIND - % FREQUENCIES, MEANS AND EXTREMES

DIR	<4	4- 10	11- 21	22- 33	34- 47	>47	TOTAL %	MEAN SPEED (KNOTS)
N		6.3	4.8				10.2	10.0
NE		2.8	2.3				5.1	10.4
E		4.9	15.9				19.1	12.7
SE		3.7	24.4	1.1			31.3	15.0
S		1.7	22.2				23.9	15.0
SW			6.3				6.3	15.1
W		2.8	1.1				4.0	9.6
NW								
CALM								
TOTAL		22.7	78.1	1.1			100.0	13.0

NO. OF OBS: 176

MAX WIND SPEED: 22 KNOTS DIRECTION: 150 DEG DAY: 11 HOUR: 10

WAVES - % FREQUENCIES, MEAN AND EXTREME (METERS) NO. OF WAVE OBS: 241

HEIGHT (M)	<1	1-1.5	2-2.5	3-3.5	4-5.5	6-7.5	8-9.5	>9.5	MEAN	MAX (DA HR)
% FREQUENCY	2.5	16.2	47.3	18.7	14.1	1.2			2.0M	6.9M (27 06)

Selected Gale and Wave Observations, North Atlantic

November and December 1980

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. 10°	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb.	Temperature °C Air	Temperature °C Sea	Sea Waves? Period sec.	Sea Waves? Height ft.	Swell Waves Dir. 10°	Swell Waves Period sec.	Swell Waves Height ft.
NORTH ATLANTIC OCEAN		NOV.															
JUTHLANDIA	ELXV	1	59.1 N	31.9 W	12	25	50	5 NM	03	0997.5	8.0	4.6	5	10	25	< 6	13
JUTHLANDIA	ELXV	2	55.1 N	34.5 W	00	25	45	5 NM	00	1007.0	8.0	12.8					
EXPORT LEADER	WCJV	5	49.5 N	22.5 W	15	14	45	2 NM	14	1005.8	11.7	13.9	6	13	13	9	23
BUYER	KCAO	5	39.7 N	62.5 W	18	16	42	5 NM	07	1001.7	21.1	21.1	4	23	18	8	32.5
GULF TRADER	KRHI	6	36.6 N	57.8 W	00	16	42	2 NM	28	1008.0	21.1	22.8		6.5	XX		11.5
SEALAND PACER	KSLB	8	45.3 N	40.0 W	12	32	M 50	1 NM	02	0986.1	12.3	16.1	4	19.5	09	9	19.5
BERGLJOT	LCXZ	8	47.8 N	37.6 W	18	11	M 42	5 NM	60	0999.0	12.9	14.5	4	6.5	13	9	13
DART EUROPE	ONDA	8	44.9 N	41.4 W	18	28	M 62	1 NM	21	0985.7	11.1	16.0	8	32.5	29	8	32.5
AMERICAN ARCHER	KFCS	8	47.3 N	36.8 W	18	07	45	2 NM	06	0990.3	5.5	5.5					
ANTONIA JOHNSON	SEDT	8	39.5 N	37.6 W	18	32	48	10 NM	02	1004.0	16.0	19.1	8	16.5	32	8	16.5
AMERICAN ARCHER	KFCS	9	47.8 N	39.8 W	00	07	45	1 NM	07	1003.5	12.3	17.3			07	>13	41
AMERICAN ACCORD	KFEZ	9	47.8 N	41.1 W	00	07	46	10 NM	00	1005.1	11.6	16.2	9	36			
SEALAND PACER	KSLB	9	46.2 N	37.3 W	12	09	M 45	5 NM	02	1005.8	13.3	14.0	6	8	09	10	29.5
MEONIA	OXON	9	39.7 N	39.6 W	12	30	M 50	5 NM	16	0996.2	17.6		12	19.5			
SEALAND LEADER	WSNH	9	37.7 N	37.1 W	18	27	M 45	5 NM	25	0996.5	19.0	19.0	9	16.5	30	>13	32.5
SEALAND GALLOWAY	KHLX	11	42.6 N	45.5 W	12	18	40	5 NM	54	0976.6	15.0	15.2	1	19.5	18	>13	32.5
DAVID P REYNOLDS	SLKL	11	23.5 N	88.1 W	18	36	45	5 NM	03	1002.4	25.5	28.0	6	11.5	05	8	14.5
OLEANDER	PJVG	11	32.7 N	64.5 W	18	28	45	10 NM	02	0999.4	19.4	22.8	6	6.5	29	9	23
SEALAND MARKET	KJVG	12	41.2 N	65.9 W	00	32	47	5 NM	25	0988.8	6.6	10.0	4	11.5	32	< 6	14.5
HAMILTON WHEC 715	WHAG	12	35.7 N	70.8 W	06	33	M 45	5 NM	00	1006.5	12.2	21.2					
AMERICAN LEGEND	KFEY	12	49.6 N	40.6 W	06	16	42	5 NM	25	0992.6	15.8	15.6	14	10	12	12	14.5
EXXON HUNTINGTON	KEAJ	12	26.2 N	86.0 W	12	06	45	10 NM	02	1014.0	24.5	26.8	5	5	06	9	19.5
BERGLJOT	LCXZ	12	39.2 N	56.7 W	12	27	M 50	2 NM	13	0975.0	14.0	23.5	9	16.5			
DOCTOR LYKES	KHNB	12	25.6 N	90.6 W	12	05	45	5 NM	60	1019.8	23.9	25.6	10	11.5			
SEALAND LEADER	WSNH	12	40.3 N	57.8 W	12	31	M 45	10 NM	15	0976.0	13.0	21.0	4	8	30	9	19.5
TFL EXPRESS	9VPU	12	50.5 N	36.7 W	18	13	M 45	1 NM	48	0986.5	14.0	13.0	4	5	13	6	8
SEALAND LEADER	WSNH	13	40.2 N	60.9 W	00	30	M 45	5 NM	15	0993.5	12.0	20.0	5	10	30	9	24.5
C V LIGHTNING	KAFP	13	42.5 N	61.5 W	00	32	45	10 NM	03	0988.5	8.9	14.4		18	32	< 6	16.5
USNS COMET TAKR 7	WJZP	13	41.2 N	61.0 W	12	32	45	5 NM	02	1001.9	9.5	17.8	5	19.5	30	< 6	26
BERGLJOT	LCXZ	13	37.2 N	59.8 W	18	31	M 45	5 NM	25	1004.0	17.8	22.0	9	16.5			
AMERICAN LEGEND	KFEY	13	45.5 N	55.3 W	18	30	42	5 NM	02	0980.7	6.7	6.7	5	8	30	8	16.5
TFL EXPRESS	9VPU	13	48.7 N	45.8 W	18	25	M 43	5 NM	59	0976.5	7.5	7.5	4	3	25	< 6	6.5
AMERICAN LEGEND	KFEY	14	43.6 N	59.5 W	06	30	42	10 NM	02	1005.8	6.7	6.7	4	6.5	30	8	14.5
AMERICAN ACE	KFCV	15	41.9 N	46.0 W	00	32	55	10 NM	02	1003.7	13.3	18.9	6	10	32	9	13
AMERICAN LEADER	KFEJ	15	48.9 N	37.3 W	12	25	45	5 NM	21	0987.0	12.5	12.2	5	11.5	25	10	16
AMERICAN LEADER	KFEJ	16	46.9 N	43.3 W	06	26	42	5 NM	58	0993.9	6.0	15.6	5	11.5	27	9	16.5
AMERICAN LEADER	KFEJ	17	44.9 N	56.7 W	18	32	48	10 NM	26	1004.2	4.4	7.2	3	10	32	< 6	10
AMERICAN LEADER	KFEJ	18	44.6 N	58.6 W	00	32	45	10 NM	02	1019.0	4.0	5.6	4	13			
GEORGE WYTHE	KIBK	18	34.5 N	43.3 W	00	29	45	5 NM	01	1006.4	16.1	18.9	7	11.5	25	10	16.5
MARCONA CONVEYOR	ELDJ	18	32.8 N	75.9 W	06	17	M 48	10 NM	03	1008.0	23.0	26.0		10	17	8	10
TFL EXPRESS	9VPU	18	31.1 N	76.3 W	11	24	M 50	5 NM	63	1006.5	24.0	25.3	XX	21			
NORTHERN LIGHT	NGYS	18	44.8 N	34.5 W	17	21	M 52	2 NM	03	0983.5	13.3	16.8	13	21	00		0
SEALAND PRODUCER	WJBJ	18	39.7 N	47.1 W	18	29	55	5 NM	81	1010.0	15.3	16.6			29	11	36
SEALAND PRODUCER	WJBJ	19	39.7 N	47.7 W	18	21	52	2 NM	81	0990.0	19.4	18.2			22	11	29.5
DART EUROPE	ONDA	19	39.6 N	50.0 W	18	25	M 42	5 NM	81	0987.6	20.6	19.0	6	11.5	25	9	28
GEORGE WYTHE	KIBK	19	35.4 N	53.5 W	18	21	55	2 NM	80	1001.7	21.8	21.3	6	18	21	9	16.5
AMERICAN ALLIANCE	KFEM	19	41.9 N	45.6 W	18	32	45	5 NM	02	1008.8	5.0	8.8	6	13	32	6	6.5
GEORGE WYTHE	KIBK	20	35.2 N	55.1 W	00	28	48	2 NM	18	1007.1	17.8	21.1	6	16.5	30	9	19.5
SEALAND PRODUCER	WJBJ	20	39.6 N	49.4 W	06	28	55	2 NM	16	0998.0	15.0	16.6					
SEALAND PRODUCER	WJBJ	21	39.4 N	51.5 W	00	31	38	10 NM	01	1014.6	11.6	18.8			30	13	32.5
AMERICAN ACCORD	KFEZ	21	51.4 N	42.8 W	12	07	42	5 NM	25	0992.6	6.1	10.0	11	29.5	07	11	31
AMERICAN ARCHER	KFCS	21	51.3 N	37.6 W	18	36	50	50 YD	48	0983.5	7.7	10.0	4	41	36	>13	21
NANTUCKET II	NNBN	22	40.5 N	69.5 W	14	29	M 48	5 NM	07	1011.2	6.5	8.7	3	5	32	7	23
SEALAND PRODUCER	WJBJ	22	40.3 N	66.2 W	18	33	78	50 YD	00	0998.0	8.0	15.5			33	< 6	65.5
MORMACSUN	WMBK	22	40.9 N	68.9 W	18	34	45	2 NM	01	1016.0	7.8	10.0	8	16.5	34	10	29.5
SEASPEED ASIA	DSEH	22	36.4 N	56.9 W	18	18	M 50	200 YD	81	0998.5	19.0	21.0		16.5			
LASH ITALIA	WJAJ	23	38.1 N	59.0 W	00	27	M 45	2 NM	21	0998.8	14.0	18.9	4	11.5	27	8	13
DOCTOR LYKES	KHNB	23	34.9 N	63.4 W	06	35	47	5 NM	02	1012.5	16.7	21.1	8	19.5	33	12	28
AMERICAN LEGEND	KFEY	23	35.2 N	65.5 W	06	30	48	10 NM	02	1018.6	16.7	21.2	12	18	35	12	34.5
SEALAND EXPRESS	KGJD	23	33.2 N	52.3 W	18	28	M 55	10 NM	62	0998.3	20.0	23.0	9	34.5	29	>13	41
LASH PACIFICO	WIEE	23	31.8 N	53.9 W	18	28	45	10 NM	62	1007.5	21.1	21.1	4	8	29	8	18
SEASPEED ASIA	DSEH	23	35.0 N	59.5 W	18	33	M 50	2 NM	25	1010.0	18.0	21.0		29.5	33		29.5
LASH PACIFICO	WIEE	24	30.1 N	52.5 W	00	28	45	5 NM	16	1009.5	21.1	21.1	4	8			
SEALAND GALLOWAY	KHLX	24	43.9 N	48.8 W	00	04	45	2 NM	02	1005.1	11.0	15.0	2	16.5	05	8	16.5
AMERICAN LEGEND	KFEY	24	36.1 N	62.3 W	06	01	48	10 NM	02	1019.3	16.7	22.2	12	24	01	12	34.5
SEALAND PACER	KSLB	24	39.5 N	41.0 W	06	13	M 47	2 NM	62	1005.5	16.2	17.8	5	10	18	10	29.5
SEALAND EXPRESS	KGJD	24	32.4 N	54.7 W	12	31	M 45	10 NM	02	1006.8	19.0	23.0	8	24.5	31	6	32.5
EXPORT LEADER	WCJV	24	45.0 N	48.5 W	18	06	45	5 NM	02	1018.3	10.6	11.7	5	10	05	9	23
RESOLUTE	KFDZ	24	36.8 N	55.0 W	18	35	45	5 NM	18	1003.3	14.1	19.4	XX	13	34	10	23
AMERICANA	IBPA	25	41.8 N	41.8 W	12	09	M 47	2 NM	02	1006.0	16.0	18.0	8	26	09	>13	23
AMERICAN LEGEND	KFEY	25	39.9 N	54.8 W	18	36	41	5 NM	60	1011.2	15.6	19.4	12	19.5	04	10	37.5
SEALAND CONSUMER	WCMF	26	40.2 N	33.0 W	06	13	50	1 NM	63	1009.1	17.7	15.6	5	24.5	14	< 6	29.5
SEALAND PACER	KSLB	26	40.7 N	60.6 W	12	28	M 46	10 NM	25	1006.8	12.8	17.3	2	3	28	7	13
SEALAND RESOURCE	WJKD	26	48.2 N	39.2 W	12	19	45	1 NM	21	1013.5	12.5	15.6	3	10	10	9	14.5
SEALAND PACER	KSLB	27	39.9 N	44.0 W	06	29	M 44	10 NM	01	1012.2	10.0	16.2	4	10	29	10	26
ADM WM M CALLAGHAN	KGYE	27	58.6 N	08.6 W	12	32	45	5 NM	90	1005.5	5.5	7.7	5	8	32	8	13
AMERICANA	IBPA	27	41.2 N	60.5 W	12	30	M 45	2 NM	62	0999.0	9.0	17.0	9	10	27	10	10
KNORR	KCEJ	27	35.8 N	49.8 W	18	32	M 52	10 NM	01	1000.1	19.4	18.9	5	5	28	12	18
SEALAND RESOURCE	WJKD	27	47.7 N	30.7 W	19	15	50	1 NM	02	1006.7	13.1	11.1	4	11.5	14	8	19.5
KNORR	KCEJ	28	35.8 N	50.3 W	00	28	M 43	5 NM	25	0997.1	16.7	19.0	5	5	28	10	16.5
SEALAND RESOURCE	WJKD	28	48.3 N	25.2 W	06	14	45	1 NM	02	1012.2	12.2	10.6	4	10	14	9	18
MEONIA	OXON	28	49.4 N	31.5 W	06	12	M 44	5 NM	21	0999.8	13.6						
AMERICAN CHARGER	KGTR	28	47.6 N	50.6 W	18	35	50	1 NM	10	1005.8	3.4	3.8	8	16.5	35	6	26
MEONIA	OXON	29	43.5 N	43.5 W	18	34	M 58	5 NM	03	1001.8	13.0	18.0	8	16.5	36	>13	26
SAPPHIRE	SMYK	29	47.9 N	40.4 W	18	02	M 43	2 NM	63	1005.0	11.0	17.0	4	10	32	8	23
MEONIA	OXON	30	44.2 N	48.1 W	00	34	M 44	2 NM	80	1011.3	9.7		8	16.5	36	>13	26
LAVAUX	HBDD	30	50.6 N	37.6 W	06	01	41	2 NM	62	1006.0	7.0	12.0	8	16.5	01	12	16.5
GREAT LAKES VESSELS																	
J A W IGLEHART	9876	9	48.6 N	84.6 W	06	12	M 44	10 NM	23		2.0	4.0	3	5			
ARTHUR M ANDERSON	9883	21	47.6 N	87.4 W	06	35	M 41	5 NM	87		3.0	7.0		5			
ENVIRONMENTAL BUOYS																	
42002		13	26.0 N	093.5 W	14	07	M 41			998.4	24.3	25.3	5	17			
44004		11	39.0 N	070.0 W	09	32	M 41			1004.6	7.1	19.5	4	12			
44004		22	39.0 N	070.0 W	12	32	M 42			1016.7	10.7	17.2	4	12			

Vessel	Nationality	Date	Position of Ship		Time GMT	Wind		Visibility n. mi.	Present Weather code	Pressure mb.	Temperature °C.		Sea Waves*			Swell Waves		
			Lat. deg.	Long. deg.		Dir. 10's	Speed kt.				Air	Sea	Period sec.	Height ft.	Dir. 10's	Period sec.	Height ft.	
NORTH ATLANTIC OCEAN		DEC.																
NORTHERN LIGHT	NGYS	2	38.6 N	27.1 W	06	11	M 04	5 NM	02	1012.0	18.3	18.9	7	18	08			6
NORTHERN LIGHT	NGYS	3	38.9 N	27.3 W	06	12	M 43	2 NM	80	1009.0	17.2	19.4	8	19.5	08			0
BALTIMORE TRADER	KASJ	3	37.0 N	71.4 W	18	31	50	5 NM	07	1014.2	7.8	23.3	5	16	31	9		16.5
OLEANDER	PJYG	3	38.7 N	71.1 W	18	29	42	5 NM	80	1008.9	5.3	16.2	9	13	28	12		19.5
OLEANDER	PJYG	4	38.7 N	71.2 W	00	29	45	5 NM	26	1014.0	6.7	14.4	9	16.5	29	12		26
TFL EXPRESS	9VPU	4	45.8 N	57.1 W	00	12	M 53	5 NM	02	1016.0	7.8	8.6						
BALTIMORE TRADER	KASJ	4	37.5 N	71.5 W	00	31	50	5 NM	07	1017.5	7.2	15.6	7	11.5	31	7		29.5
MORMACGLEN	WMDL	4	33.7 N	64.6 W	12	35	45	10 NM	02	1015.0	14.5	22.2	5	19.5	34	7		23
NANTUCKET II	WNRN	4	40.7 N	69.2 W	14	31	M 50	5 NM	07	1012.0	1.0	10.5	5	10	29	10		26
SAPPHIRE	SMYK	4	37.6 N	67.5 W	18	29	M 50	2 NM	02	1007.0	10.0	18.5	4	13	29	6		16.5
AMERICAN ACCORD	KFEZ	5	37.2 N	62.7 W	00	30	42	10 NM	02	1006.0	12.2	22.2	11	23				
SAPPHIRE	SMYK	5	37.1 N	67.2 W	06	30	M 45	2 NM	02	1009.0	11.0	21.0	4	13	31	7		18
MORMACGLEN	WMDL	5	36.6 N	69.2 W	18	32	45	10 NM	02	1012.7	10.6	22.2	7	21	32	10		23
AMERICAN RANGER	KRRW	5	35.7 N	68.0 W	18	31	43	10 NM	02	1014.2	15.0	18.3	6	11.5	32	11		26
NORTHERN LIGHT	NGYS	8	44.2 N	43.9 W	15	27	M 44	10 NM	01	0999.2	11.2	17.8	6	13	26	12		18
AMERICAN ACCORD	KFEZ	8	47.5 N	27.7 W	18	20	45	5 NM	02	0996.0	14.0	13.3	8	23				
MORMACDRACO	WMSD	10	35.8 N	66.7 W	12	25	45	5 NM	02	1010.0	21.1	21.7	5	13	25	7		13
AMERICAN ALLIANCE	KFEM	14	50.8 N	25.2 W	18	31	50	5 NM	15	1017.3	6.7	12.3	5	16.5	30	12		32.5
AMERICAN LEADER	KFFJ	14	49.5 N	46.8 W	18	20	45	10 NM	02	1015.0	14.0	6.1		16.5	20			16.5
AMERICAN LEGEND	KFEY	15	48.7 N	47.3 W	06	19	42	5 NM	80	1015.2	18.4	16.7	6	10	19	9		16.5
J LOUIS	SMBC	15	47.9 N	60.7 W	12	27	45	5 NM	22	0995.2	- 6.8	1.7	9	26.5	27	10		28
JALAVIHAR	ATPG	15	47.2 N	07.8 W	12	30	42	2 NM	62	1021.0	9.5	12.0	12	18	27	10		26
MORMACSUN	WMRA	16	43.7 N	66.7 W	18	09	43	.5 NM	98	1011.0	- 0.5	7.2	6	10	14	8		11.5
AMERICAN ALLIANCE	KFEM	16	49.8 N	39.2 W	18	27	50	5 NM	22	1024.0	3.3	14.5	8	23	27	10		19.5
AMERICAN ALLIANCE	KFEM	17	49.5 N	40.5 W	00	29	50	5 NM	02	1032.7	4.4	14.4	4	6.5	29	10		26
TFL EXPRESS	9VPU	17	58.6 N	10.5 W	11	26	M 57	10 NM	69	0989.6	6.5	11.0						
TFL EXPRESS	9VPU	18	58.1 N	15.3 W	06	29	M 51	5 NM	62	0999.3	7.0	10.3						
AMERICAN ACCORD	KFEZ	18	47.0 N	28.3 W	18	25	48	10 NM	02	1022.8	14.5	13.4	10	19.5				
POSSEHL	WBRD	19	30.9 N	14.3 W	12	09	18	> 25 NM	02	1030.0	18.0	19.0	4	8	36	< 4		37.5
TFL EXPRESS	9VPU	19	56.7 N	24.9 W	12	31	M 60	5 NM	02	0973.5	8.5	10.0						
AMERICAN ACCORD	KFEZ	19	45.7 N	33.0 W	18	24	48	5 NM	02	1014.5	15.6	13.9	11	37.5	24	12		41
ADM WM M CALLAGHAN	KGYE	20	49.2 N	05.9 W	06	27	45	5 NM	25	1008.5	11.1	10.6	8	16.5	25	10		19.5
TFL EXPRESS	9VPU	20	53.9 N	35.9 W	23	26	M 55	10 NM	02	0991.0	5.5	8.2						
TFL EXPRESS	9VPU	21	53.1 N	38.0 W	11	24	M 52	10 NM	02	0998.0	3.0	7.5						
GOLDEN ENDEAVOR	WDPU	22	48.9 N	63.5 W	06	29	45	1 NM	02	1022.0	17.0	1.1	8	11.5	27	8		19.5
AMERICAN ACCORD	KFEZ	22	41.9 N	56.3 W	12	31	38	10 NM	02	1029.0	- 1.1	6.7	9	32.5				
TFL EXPRESS	9VPU	22	50.2 N	45.4 W	19	25	M 45	2 NM	23	1004.6	- 7.6	7.9						
TFL EXPRESS	9VPU	23	48.9 N	48.1 W	06	26	M 65	5 NM	23	1018.2	- 4.0	5.1						
ADM WM M CALLAGHAN	KGYE	25	41.1 N	56.8 W	12	19	55	10 NM	07	1005.8	10.4	18.8	8	23	25	8		16.5
BUILDER	KEYB	25	40.4 N	56.2 W	18	20	45	2 NM	02	1007.0	20.0	21.7	6	14.5	28	7		24.5
BALTIMORE TRADER	KASJ	26	31.6 N	74.4 W	00	33	45	5 NM	07	1020.0	10.6	21.7	6	10	33	7		16.5
CHERRY VALLEY	WIPK	26	31.7 N	68.8 W	06	35	44	5 NM	02	1017.3	11.7	18.3	3	10	35	8		8
BUILDER	KEYB	26	41.6 N	49.5 W	12	19	50	2 NM	02	1015.0	15.6	14.4	6	16.5	19	7		29.5
TFL EXPRESS	9VPU	29	35.6 N	72.4 W	00	09	M 52	2 NM	40	1012.6	17.0	20.3						
MORINQUEN	KPCV	29	37.2 N	74.8 W	12	07	45	5 NM	21	1007.8	11.0	13.0	4	13	07	8		21
NORTHERN LIGHT	NGYS	30	41.1 N	57.2 W	18	14	M 45	2 NM	61	0995.0	16.7	21.6	7	11.5	14	>13		24.5
ADM WM M CALLAGHAN	KGYE	31	40.8 N	51.6 W	00	12	45	5 NM	18	1012.0	15.6	15.0	6	16.5	16	7		19.5
SEALAND RESOURCE	WJRD	31	42.8 N	54.2 W	00	17	55	5 NM	60	0997.0	13.5	1.0	3	13	17	6		16.5
GREAT LAKES VESSELS																		
A H FERBERT	9801	2	42.8 N	87.3 W	18	34	M 48	2 NM	73		1.0	6.0	3	18				
EDWIN H GOTT	9901	3	44.2 N	82.4 W	00	35	M 48	.25 NM	90		- 5.0			13				
JOHN DYKSTRA	9852	9	46.8 N	85.0 W	00	31	M 41	10 NM	02		- 2.0	4.0						
ARTHUR M ANDERSON	9863	11	46.7 N	84.3 W	00	32	M 42	5 NM	74		-10.0	60.0		6.5				
PHILIP R CLARKE	9879	13	47.7 N	89.0 W	00	32	M 50	5 NM	78		- 8.0	5.0	10	11.5				
ARTHUR M ANDERSON	9863	13	47.7 N	88.8 W	00	33	M 42	5 NM	74		- 7.0	4.0		14.5				
A H FERBERT	9801	13	47.5 N	87.3 W	00	33	M 43	5 NM	66		- 2.0	4.0	3	8				
BENJAMIN F FAIRLESS	9803	13	47.2 N	87.5 W	12	34	M 45	5 NM	07		-11.0	4.0	10	13				
ARTHUR M ANDERSON	9863	14	46.6 N	84.6 W	06	33	45	5 NM	74		-12.0	4.0						
CASON J CALLAWAY	9841	14	47.7 N	87.8 W	06	32	M 46	2 NM	75		-12.0	3.0	10	14.5				
WILLIS B BOYER	9859	14	43.3 N	82.4 W	12	27	M 44	> 25 NM	02		- 5.0	2.0	3	6.5				
MESABI MINER	9887	14	47.6 N	87.3 W	12	34	M 42	1 NM	66		-12.0	4.0	7	10.5				
EDWIN H GOTT	9901	17	45.1 N	86.6 W	18	21	M 46	1 NM	75		- 1.0			14.5				
JOHN DYKSTRA	9852	17	46.8 N	86.1 W	18	20	M 56	200 YD	75		- 3.0	4.0	8	8				
J A M IGLEHART	9876	18	44.2 N	83.1 W	06	25	M 48	5 NM	00		1.0	3.0	3	6.5				
ARTHUR M ANDERSON	9863	18	47.5 N	87.4 W	18	31	M 46	10 NM	02		-15.0	4.0	9	13				
ARTHUR M ANDERSON	9863	24	43.1 N	87.7 W	18	34	M 42	10 NM	02		-11.0	3.0	8	13				
ENVIRONMENTAL BUOYS																		
41001		28	34.7N	072.7W	21	07	M43						5	17				
41001		29	34.7N	072.7W	00	09	M43						5	17				
44004		03	39.0N	070.0W	17	35	M42			1009.4	4.8	18.6	4	11				
44004		04	39.0N	070.0W	04	29	M45			1015.8	5.9	15.3	4	14				
44004		05	39.0N	070.0W	00	31	M41			1016.4	6.7	17.0	4	14				

\+ Direction for sea waves same as wind direction
X Direction or period of waves indeterminate
M Measured wind

NOTE: The observations are selected from those with winds ≥ 35 kn or waves ≥ 25 ft from May through August (≥ 41 kn or ≥ 33 ft, September through April). In cases where a ship reported more than one observation a day with such values, the one with the highest windspeed was selected.

Selected Gale and Wave Observations, North Pacific

November and December 1980

Vessel	Nationality	Date	Position of Ship		Time GMT	Wind		Visibility	Present Weather	Pressure	Temperature °C		Sea Waves*			Swell Waves		
			Lat. deg.	Long. deg.		Dir. 10°	Speed kt.	n. mi.	code	mb	Air	Sea	Period sec.	Height ft.	Dir. 10°	Period sec.	Height ft.
NORTH PACIFIC OCEAN		NOV.																
DISCOVERER OSS	WTFA	1	58.3 N	139.6 W	00	10	M 44	1 NM	81	0984.3	8.9	9.5	6	10	10	9	10
RALPH B JOHNSON	6ZDJ	1	38.7 N	150.0 E	06	27	M 41	10 NM	02	1007.5	16.5	19.5	12	21	27	13	23
SEALAND DEFENDER	KGJB	1	41.0 N	146.9 E	06	26	M 48	2 NM	64	1000.5	11.0	14.0	5	19.5	XX	8	24.5
VAN TRIUMPH	6ZJP	1	43.8 N	153.9 E	18	23	M 45	2 NM	03	0995.0	10.0	8.0					
OGDEN FRASER	SMPQ	1	33.6 N	164.1 W	18	29	M 44	5 NM	15	1004.5	19.5	22.0	4	6.5	28	10	16.5
SEALAND MCLEAN	WHGA	1	36.3 N	166.4 W	18	29	SO	10 NM	15	0998.9	15.0	16.2	5	6.5	29	9	29.5
LNG LEO	WDZB	2	20.0 N	131.5 E	00	05	M 45	5 NM	25	1009.5	28.0	26.7	4	13	05	< 6	19.5
JARVIS WMEC 725	NAQD	2	48.7 N	156.3 W	18	35	M 43	.5 NM	10	0976.5	6.2		9	16.5			
JARVIS WMEC 725	NAQD	3	49.6 N	154.2 W	00	01	M 40	.5 NM	63	0973.0	6.0		10	21			
PACBARON	ABYI	3	41.4 N	151.6 W	00	29	M 51	1 NM	44	0991.0	17.0	16.0	10	18.5	29	10	19.5
KOREAN FIR	ABWW	3	48.2 N	153.7 W	00	33	M 51	.5 NM	62	0969.5	8.0	8.0	8	16.5	34	12	23
NEWARK	WNDO	3	53.9 N	138.3 W	06	10	45	2 NM	02	0984.1	10.0	10.0	4	8	11	7	16.5
WESTWARD VENTURE	KHJB	3	53.6 N	135.2 W	06	12	M 43	5 NM	63	0995.4	10.0	11.7					
PRESIDENT KENNEDY	KCAK	3	53.5 N	154.6 W	12	36	45	2 NM	63	0980.0	9.4	7.2	3	13	36	7	19.5
MORNING GLORY	6ZUU	3	47.3 N	141.1 W	18	23	M 42	5 NM	03	0999.6	13.0	13.0	8	11.5	22	9	14.5
MAINE ORE	6ZPT	3	53.6 N	156.8 W	18	01	SO	10 NM	07	0983.0	4.0	7.0	10	16.5	01	10	19.5
MORNING GLORY	6ZUU	4	47.8 N	142.3 W	00	22	M 46	5 NM	80	0995.8	13.0	12.5	8	13	22	9	13
PRESIDENT MC KINLEY	WVFZ	4	38.4 N	170.8 E	12	01	48	2 NM	07	0993.1	12.2	15.6					
SEALAND MCLEAN	WHGA	4	35.1 N	167.5 E	12	27	45	10 NM	81	1000.0	20.0	20.5	4	10	27	8	23
ALASKA STANDARD	WHDN	4	59.7 N	149.0 W	12	09	45	1 NM	65	0986.5	6.7	9.0	4	13	17	6	23
PRESIDENT MC KINLEY	WVFZ	5	38.2 N	174.2 E	00	32	48	10 NM	16	1007.0	13.9	16.7	3	5	34	< 6	16.5
ATLANTIC PIONEER	WJWN	5	37.7 N	176.4 W	00	24	M 55	2 NM	05	0983.0	19.0	17.0	4	13	24	< 6	10
ORIENTAL STATESMAN	ELRE	5	34.8 N	178.1 W	00	27	M 52	2 NM	01	0995.5	21.5	20.0					
QUEENS WAY BRIDGE	JMJE	5	42.1 N	175.8 W	06	35	M 43	2 NM	63	0987.5	5.5	10.5	3	11.5	05	7	13
MARITIME QUEEN	HOMC	5	19.5 N	121.4 E	12	09	60	.5 NM	64	0991.0	26.5	27.0	XX	73.5			
WESTERN HIGHWAY	3FTF	5	44.4 N	164.1 W	12	10	M 43	1 NM	63	0978.4	7.0	7.0					
UNITED SPIRIT	5MKM	5	19.9 N	121.9 E	18	14	M 55	1 NM	80	0991.0	27.0	28.5	6	16.5	14	6	16.5
EASTERN HORNET	6ZDD	5	47.0 N	168.1 W	18	05	M 42	2 NM	18	0989.5	6.5	6.0	4	6.5	08	10	16.5
ARILD MAERSK	OXTH	5	35.3 N	168.6 W	18	30	45	10 NM	01	1006.0	16.0	17.0	3	24.5	30	9	39
FRIENDSHIP	ELXP	5	41.0 N	166.2 W	18	28	M 60	1 NM	63	0981.5	9.0	19.0	XX	26	26	12	32.5
PRINCE OF TOKYO	A8GJ	5	42.2 N	161.3 W	21	22	M 50	.25 NM	42	0973.0	10.0	12.0	8	14.5	22	8	14.5
SEATRAIN CHESAPEAKE	DSGC	5	35.7 N	162.4 W	23	27	M 50	5 NM	02	1005.0	19.0	16.0	12	23	27	12	23
PRINCE OF TOKYO	A8GJ	6	42.1 N	160.3 W	00	23	M 45	200 YD	42	0974.0	11.0	12.0	9	16.5	25	8	16.5
ARILD MAERSK	OXTH	6	38.1 N	170.0 W	00	30	36	10 NM	03	1012.0	16.0		4	19.5	30	10	32.5
PRESIDENT POLK	WNFI	6	43.0 N	158.0 W	00	25	45	2 NM	25	0975.0	8.9	10.0	10	6.5	23	12	14.5
CHEVRON MISSISSIPPI	WXBR	6	46.0 N	132.7 W	00	21	42	2 NM	81	0992.5	12.9	13.3	5	8	20	10	24.5
FRIENDSHIP	ELXP	6	41.0 N	163.9 W	00	27	M 60	1 NM	25	0988.0	10.0	14.0	XX	26	27	8	32.5
MARITIME QUEEN	HOMC	6	19.8 N	122.6 E	00	16	70	.25 NM	62	0991.0	27.0	26.0	XX	41			
WESTERN HIGHWAY	3FTF	6	43.8 N	155.1 W	18	31	M 42	2 NM	02	0999.8	9.5	8.0	5	14.5	31	7	21
SAMUEL S	SLMX	7	33.8 N	178.9 E	00	24	M 42	2 NM	02	1003.0	19.5	20.0	6	3	05	11	13
LNG AQUARIUS	WSKJ	7	23.5 N	125.8 E	01	18	M 60	1 NM	07	0998.3	26.2	26.7	10	24.5	18	11	29.5
BLESS RIVER	DSBS	7	38.2 N	134.2 W	18	25	M 32	10 NM	02	1017.0	17.0	14.0	4	14.5	28	8	42.5
BLESS RIVER	DSBS	8	38.8 N	135.4 W	00	28	M 35	10 NM	02	1019.7	17.0	14.0	6	14.5	28	8	44
SEALAND LIBERATOR	KNRP	8	39.7 N	145.9 E	06	29	M 45	10 NM	02	1002.0	9.5	10.0	6	18	29	6	18
TONSINA	KJDG	8	46.4 N	131.0 W	12	23	55	10 NM	18	1008.0	12.2	14.0	3	6.5	28	8	19.5
PRESIDENT KENNEDY	KCAK	8	44.5 N	149.9 E	18	27	50	5 NM	62	0995.0	2.0	5.6	3	10	27	6	23
PERENNIAL ACE	HOMQ	8	42.5 N	165.0 E	21	27	M 41	2 NM	01	0998.0	13.0	13.5	5	14.5	28	7	14.5
PRESIDENT KENNEDY	KCAK	9	43.4 N	148.7 E	00	27	47	10 NM	01	1004.5	2.0	8.9	3	11.5	27	6	23
BLESS RIVER	DSBS	9	40.7 N	140.2 W	00	27	M 23	10 NM	02	1018.5	12.5	12.0	6	14.5	27	8	32.5
NEPTUNE AMBER	S6CY	9	52.8 N	142.8 W	00	29	M 35	10 NM	02	1003.5	6.8	8.0	4	29.5	29	6	39
PRESIDENT JEFFERSON	WPGE	9	49.2 N	159.2 E	06	26	48	2 NM	26	0980.7	2.2	3.9	9	19.5	26	6	19.5
MORNING GLORY	6ZUU	9	52.8 N	176.3 E	12	24	M 41	1 NM	18	0983.3	8.0	7.0			24	8	19.5
SKAUGRAN	LHUK	9	41.9 N	179.5 W	12	20	47	.25 NM	55	1012.0	13.5						
MAINE ORE	6ZPT	9	48.5 N	160.8 E	18	28	45	2 NM	85	0990.0	2.5	6.0	12	21			
IKAN KERISI	9VKG	9	51.8 N	166.7 E	21	25	65	.5 NM	07	0968.0	4.0						
MORNING GLORY	6ZUU	10	52.6 N	176.3 E	00	23	M 36	2 NM	26	0980.3	6.0	6.0	6	10	24	10	19.5
MAINE ORE	6ZPT	10	48.0 N	160.6 E	00	27	42	10 NM	07	0993.0	2.5	6.0	12	23			
SEALAND EXCHANGE	KFOU	10	40.9 N	161.1 E	00	27	45	10 NM	15	1016.0	11.7	13.9	4	6.5	27	>13	19.5
IKAN KERISI	9VKG	10	51.5 N	166.0 E	06	27	70	200 YD	07	0973.0	6.0						
IKAN KERISI	9VKG	11	51.0 N	169.2 E	00	27	45	5 NM	02	0989.0	5.0						
MAINE ORE	6ZPT	11	46.9 N	158.5 E	06	29	41	10 NM	07	1013.5	3.0	6.0	12	21	28		19.5
MING GALAXY	BLMW	11	46.4 N	175.5 W	06	27	M 23	10 NM	03	1000.5	8.0	7.3	8	13	27	8	32.5
SEALAND EXCHANGE	KFOU	11	44.3 N	174.4 E	06	28	40	10 NM	25	1011.1	5.0	11.1	3	8	27	< 6	34.5
SEALAND EXCHANGE	KFOU	12	45.8 N	177.2 W	00	27	45	5 NM	15	1003.8	6.6	5.5	5	8	27	10	19.5
GREAT LAND	WFDP	12	50.6 N	129.4 W	18	16	M 46	1 NM	63	1012.0	12.2	11.7	6	6.5	17	>13	6.5
PRESIDENT TYLER	WEZM	12	35.9 N	174.8 W	18	30	M 09	10 NM	02	1019.5	16.1	15.6	1	1.5	31	10	32.5
MAINE ORE	6ZPT	13	42.4 N	150.4 E	06	17	42	1 NM	07	0999.0	14.0	6.0	8	16.5			
POLAR ALASKA	SLFU	13	52.6 N	179.5 E	06	31	M 55	.25 NM	89	0995.0	3.0	3.0	5	3	31	7	13
SEATRAIN CHESAPEAKE	DSGC	13	34.2 N	140.6 E	11	26	M 42	5 NM	01	1008.0	17.0	22.0	12	16.5	26	10	13
AMUR CAREER	3EXG	13	44.4 N	151.1 E	18	26	M 48	5 NM	03	0999.0	4.0	10.0	7	10	26	9	11.5
PRESIDENT TYLER	WEZM	13	35.7 N	176.4 E	18	34	M 22	10 NM	02	1026.8	15.0	19.5	1	1.5	34	10	34.5
PRESIDENT MADISON	WCIP	13	54.5 N	171.1 W	18	34	45	10 NM	02	0994.0	5.0	3.9	5	11.5	34	7	11.5
IKAN KERISI	9VKG	13	44.9 N	149.8 E	23	26	45	5 NM	03	1000.1	4.0						
AMUR CAREER	3EXG	14	44.8 N	152.8 E	00	27	M 45	10 NM	02	1004.0	9.0	10.0	7	10	27	9	11.5
PRESIDENT TYLER	WEZM	14	35.7 N	174.2 E	00	05	M 20	10 NM	02	1030.0	16.1	20.0	1	1.5	34	10	34.5
GREAT LAND	WFDP	14	49.3 N	127.0 W	12	12	M 42	2 NM	61	1015.0	10.0	12.3	5	8	13	>13	6.5
WASHINGTON WOOD	JEOV	14	54.3 N	164.7 W	12	32	45	5 NM	03	1000.1	5.5	6.9	6	10	32	6	10
POLAR ALASKA	SLEU	14	51.3 N	166.2 E	18	24	M 43	5 NM	62	0999.0	3.8	3.0	4	13			
POLAR ALASKA	SLFU	15	50.6 N	169.5 E	00	20	M 45	5 NM	26	0999.8	3.0	3.0	5	10	20	< 6	10
NEPTUNE AMBER	S6CY	15	42.2 N	154.7 E	06	29	M 45	1 NM	02	1012.0	6.9	12.5	6	49	27	>13	65.5
PERENNIAL ACE	HOMQ	15	47.1 N	136.2 W	06	17	M 45	10 NM	07	1025.0	12.0	12.0					
WASHINGTON WOOD	JEOV	15	54.0 N	173.8 W	12	27	50	2 NM	03	0994.0	3.5	4.0	8	11.5	27	8	11.5
EXXON PHILADELPHIA	WNFJ	15	51.4 N	136.0 W	12	16	M 50	10 NM	02	1011.2	12.5	10.0	4	16.5			
ARCO CALIFORNIA	WMCV	15	53.3 N	137.9 W	18	16	M 50	5 NM	07	0997.2	10.0	8.9	7	14.5	16	8	24.5
MANHATTAN	WJAF	15	56.8 N	142.1 W	18	12	45	2 NM	63	0978.9	7.2	6.3	5	10	12	8	16.5
ANNA MAERSK	OYKS	15	41.9 N	165.0 E	18	25	47	10 NM	02	1013.8	7.9		5	10			
BROOKS RANGE	WSRP	15	48.3 N	132.8 W	18	18	45	10 NM	02	1019.0	12.8	11.7	8	10	18	12	16.5
VAN TRIUMPH	6ZJP	15	41.9 N	166.1 E	18	29	M 55	10 NM	00	1010.0	9.8	12.5					
NEPTUNE DIAMOND	9VVT	15	52.4 N	135.6 W	18	15	M 55	1 NM	44	1005.1	11.5	12.9	6	11.5	16	8	21
BELLMAN	9VUP	15	52.0 N	134.1 W	18	16	M 41	2 NM	03	1012.0	11.0	13.0	5	10	16	7	13
SEALAND EXCHANGE	KFOU	15	49.4 N	131.5 W	18	16	48	10 NM	02	1018.9	11.2	11.2	XX	10	16	11	23
BRILLIANT STAR	5MSK	15	48.7 N	138.1 W	21	15	M 55	200 YD	62	0992.0	13.0	13.0	14	10	15	6	13
AMERICA SUN	WNEJ	15	58.1 N	143.4 W	21	11	50	200 YD	05	0971.9	14.0	7.2	6	8	09	9	24.5
AMERICA SUN	WNEJ	16	57.9 N	143.2 W	00	14	50	1 NM	07	0971.9	11.0	6.0	6	8	14	9	24.5

Vessel	Nationality	Date	Position of Ship Lat. deg.	Long. deg.	Time GMT	Wind Dir. true	Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb.	Temperature °C Air	Sea	Sea Waves* Period sec.	Height ft.	Dir. true	Swell Waves Period sec.	Height ft.
NORTH PACIFIC OCEAN		NOV.															
EXXON PHILADELPHIA	WNFJ	16	51.2 N	135.8 W	00	16	N 40	.5 NM	52	0999.4	13.5	10.0	8	13	16	11	24.5
ARCO CALIFORNIA	WMCV	16	53.2 N	137.4 W	00	14	N 40	2 NM	81	0986.1	9.5	8.9	9	65.5			
ARCO SAG RIVER	WLDF	16	58.2 N	149.6 W	00	25	N 46	2 NM	20	0972.1	6.1	6.7	10	39	03	10	39
ALASKA STANDARD	WHDN	16	58.1 N	151.8 W	00	36	40	2 NM	63	0982.5	3.3	5.5	3	13	05	6	32.5
ANNA MAERSK	OYRS	16	42.5 N	167.9 E	00	28	45	10 NM	83	1016.5	7.8		14	16.5			
GREAT LAND	WFDP	16	57.0 N	144.1 W	00	20	N 42	5 NM	02	0972.1	3.9	9.2	5	8	13	< 6	8
CHEVRON CALIFORNIA	WCGN	16	49.7 N	137.8 W	00	20	55	2 NM	51	9987.0	12.2	8.3	5	11.5	20	6	23
UNIVERSAL WING	WKRF	16	48.5 N	134.5 W	00	16	N 41	1 NM	61	0999.5	13.0	12.5	3	14.5	16	10	13
PRINCE WILLIAM SOUND	WSDX	16	59.3 N	145.1 W	00	07	N 80	.5 NM	00	0972.0	4.4	15.0	XX	99			
BELLMAN	9VUP	16	52.5 N	135.9 W	00	15	N 38	.5 NM	21	0995.4	11.5	14.0	6	16.5	18	7	19.5
NEPTUNE DIAMOND	9VYT	16	53.2 N	137.6 W	00	11	N 36	1 NM	44	0984.5	11.1	12.9	6	11.5	15	8	24.5
SEALAND EXCHANGE	KFOU	16	48.9 N	128.5 W	00	16	45	5 NM	02	1020.0	10.0	10.6	XX	8	16		18
KEYSTONE ACE	WBAD	16	49.6 N	173.3 E	00	02	N 41	200 YD	64	0982.0	3.0						
PERENNIAL ACE	WDMG	16	48.1 N	128.5 W	00	13	N 42	5 NM	02	1021.0	11.5	12.5	5	10	15	6	10
IRIS ISLAND	JPKG	16	52.3 N	134.3 W	00	15	N 45	.25 NM	44	1003.0	11.5	10.0	6	10	16	9	16.5
EASTERN ROYAL	JNZR	16	50.3 N	130.2 W	06	15	N 43	5 NM	03	1011.0	10.0	12.0	10	23	17	10	16.5
BLESS RIVER	DSBS	16	42.7 N	179.0 E	06	27	N 45	.5 NM	18	1006.5	8.0	6.0	7	11.5	27	7	29.5
PRESIDENT MADISON	WCIP	16	49.1 N	162.6 E	06	28	50	2 NM	74	1003.7	0.6	3.3	5	8	29	11	18
PHILADELPHIA	WJBO	16	55.3 N	139.7 W	06	16	45	5 NM	02	0981.0	5.0	10.0	4	11.5	23	>13	41
PORTLAND	WNDF	16	58.8 N	150.7 W	06	35	N 44	1 NM	63	0967.9	3.8	7.2	7	19.5	35	8	19.5
MANHATTAN	WJAF	16	55.2 N	140.0 W	12	23	45	5 NM	15	0987.1	7.8	8.9	5	10	18	9	19
PRINCE WILLIAM SOUND	WSDX	16	57.8 N	142.5 W	18	19	N 42	5 NM	02	0977.0	10.0	6.8	XX	13	23	8	24.5
MOHSINS BREEZE	JEOU	16	50.7 N	171.0 W	18	13	N 45	5 NM	03	0970.0	9.0	6.0	10	16.5	13	10	16.5
ASIA INDUSTRY	A8SI	16	34.6 N	174.0 W	23	30	N 46	.5 NM	97	0996.0	19.0	21.0	8	6.5	30	8	8
EASTERN WORLD	ELVA	16	44.9 N	171.0 W	23	26	N 45	10 NM	01	1007.0	7.0	7.0	6	16.5	27	12	41
KEYSTONE ACE	WBAD	17	49.9 N	179.0 W	00	29	N 42	2 NM	03	0990.3	6.8						
WESTWARD VENTURE	KHJB	17	54.3 N	137.0 W	00	21	N 27	10 NM	03	1002.5	7.8	10.0	3	6.5	23	7	32.5
SOUTH EXPRESS	ABWR	17	46.6 N	166.5 W	00	24	N 50	8 NM	03	0998.0	8.0	8.0	8	32.5	24	>13	24.5
PRINCE WILLIAM SOUND	WSDX	17	57.3 N	145.3 W	00	28	N 50	5 NM	02	0980.2	7.1	8.3	XX	24.5			
PRESIDENT MADISON	WCIP	17	45.3 N	157.0 E	06	28	45	10 NM	02	1014.0	2.2	3.9	5	14.5	28	11	18
BLUE OCEAN	JKOH	17	50.0 N	159.4 W	12	20	N 55	2 NM	44	0985.0	7.0	6.8	7	24.5	20	7	24.5
IRIS ISLAND	JPKG	17	53.2 N	144.9 W	18	27	N 47	2 NM	21	0993.0	6.0	6.5					
BELLMAN	9VUP	17	53.6 N	148.2 W	18	26	N 41	5 NM	21	1000.8	6.1	11.0	4	10	26	7	16.5
EASTERN WORLD	ELVA	17	45.4 N	163.0 W	23	26	N 30	> 25 NM	02	1012.0	10.0	11.8	4	14.5	27	8	32.5
BLUE OCEAN	JKOH	18	50.1 N	154.1 W	00	24	N 48	5 NM	03	0995.0	8.0	7.5	7	21	24	7	21
PRINCE WILLIAM SOUND	WSDX	18	55.5 N	136.0 W	00	24	N 47	5 NM	21	0999.5	8.8	9.4	XX	16.5			
NEWARK	WNDQ	18	54.6 N	138.7 W	00	25	45	5 NM	15	0995.6	5.6	10.8	5	6.5	23	7	13
BELLMAN	9VUP	18	53.8 N	149.2 W	06	22	N 43	5 NM	15	0991.0	6.0	10.0	4	11.5	23	6	14.5
IRIS ISLAND	JPKG	18	53.4 N	150.3 W	18	23	N 47	2 NM	02	0999.0	5.0	6.0					
EASTERN WORLD	ELVA	18	45.7 N	154.7 W	23	27	N 26	10 NM	02	0999.5	9.0	8.0	5	19.5	27	9	39
KOREAN PRIDE	ELXF	19	42.5 N	156.0 E	00	30	N 48	5 NM	02	1011.0	9.0	5.0	8	10	30	>13	32.5
BLESS RIVER	DSBS	19	40.9 N	163.4 E	06	27	N 45	2 NM	18	1006.2	8.0	7.0	7	11.5	28	7	24.5
GLACIER BAY	KACF	19	53.3 N	148.6 W	12	23	35	10 NM	02	0996.7	5.5	5.0	6	10	23	6	32.5
MOBILE MERIDIAN	KGSM	19	55.7 N	138.3 W	17	13	N 60	2 NM	07	0999.7	7.7	7.7	4	11.5	16	8	14.5
GLACIER BAY	KACF	20	52.0 N	148.9 W	00	22	40	10 NM	18	0998.0	5.5	5.0	6	10	22	6	32.5
SEALAND EXPLORER	WGJF	20	38.0 N	177.0 E	06	20	N 46	10 NM	01	1006.5	13.5	15.0	5	23	30	6	29.5
NEPTUNE JADE	S6CT	20	44.2 N	165.1 W	18	14	N 44	.5 NM	58	0988.5	8.5	8.8	6	6.5	15	6	16.5
TENNESSEE	LFEI	20	47.1 N	169.1 W	20	17	47	5 NM	02	0982.0	8.0	7.0					
SIMBA	GWEC	20	49.2 N	166.8 W	23	23	N 41	5 NM	01	0989.2	9.3	8.0	4	10	17	6	11.5
NEPTUNE JADE	S6CT	21	43.9 N	162.2 W	00	22	N 33	2 NM	52	0995.0	11.0	8.2	4	3	13	12	41
NEPTUNE AMBER	S6CY	21	33.2 N	127.7 E	06	04	N 43	2 NM	10	1012.2	17.0	20.7	4	13	04	7	24.5
NEPTUNE DIAMOND	9VYT	21	47.9 N	156.1 E	06	27	N 54	5 NM	01	0977.0	3.0	7.0	7	16.5	27	8	16.5
SIMBA	GWEC	21	44.4 N	164.7 W	06	23	N 46	5 NM	25	0991.0	8.5	7.5			18	6	11.5
SUNNY PIONEER	H3SY	21	50.1 N	152.7 W	12	23	N 45	5 NM	00	0999.3	7.5	6.0	7	18	17	6	18
VIENNA WOODS	5LBT	21	44.1 N	162.5 E	23	30	N 47	2 NM	27	1004.0	4.0	8.0	11	14.5	30	12	16.5
AMERICAN LANCER	WZJB	22	34.5 N	140.8 E	00	04	45	1 NM	81	1007.8	17.8	21.7	5	14.5	02	6	18
STREAM HAWSER	ELUN	22	48.4 N	160.0 E	00	31	N 49	1 NM	20	0996.0	1.0	4.0					
VIENNA WOODS	5LBT	22	44.0 N	164.5 E	05	30	N 50	5 NM	72	1003.0	3.0	4.0	12	19.5	30	12	24.5
SEALAND DEFENDER	KGJB	22	41.8 N	175.2 E	06	29	N 45	5 NM	02	0996.8	8.0	10.0	5	10	30	12	18
ALASKA STANDARD	WHDN	22	59.1 N	151.1 W	12	09	45	5 NM	63	0987.7	5.0	6.2	4	16.5	19	6	23
ORIENTAL MERCHANT	VRCS	22	43.2 N	176.9 E	18	28	N 32	10 NM	52	0987.0	6.8	8.8			29	10	32.5
OGDEN CONGO	A8TP	22	41.3 N	174.1 E	18	29	N 42	5 NM	03	1003.0	7.0	12.0	10	13	29	>13	19.5
VAN HAWK	D5ZU	22	44.0 N	177.5 W	18	26	N 45	10 NM	18	0985.5	5.0	7.0					
SEALAND DEFENDER	KGJB	23	42.0 N	177.6 W	00	28	N 55	5 NM	27	0987.0	8.0	12.0	6	14.5	26	8	19.5
CALIFORNIA RAINBOW	JNJL	23	44.5 N	166.7 E	00	27	N 55	200 YD	23	0999.0	4.0	8.0	12	10	27	>13	23
SACRAMENTO	H3DR	23	50.4 N	160.3 W	12	13	N 45	10 NM	81	0986.0	3.0	2.0	10	16.5	15	9	26
JARVIS WHEC 725	NAOD	23	54.4 N	164.9 W	12	07	N 42	2 NM	50	0977.4	3.9	7.0	5	8			
VAN HAWK	D5ZU	23	43.4 N	171.7 W	12	27	N 50	2 NM	24	0988.9	6.0	6.0					
SHERMAN WHEC 720	NMHJ	23	55.1 N	156.7 W	18	09	N 45	2 NM	61	0977.0	4.4	6.7	6	14.5			
TENNESSEE	LFEI	24	48.8 N	146.4 W	00	18	55	1 NM	07	0995.0	10.0	9.8	10	32.5			
VAN HAWK	D5ZU	24	43.8 N	169.1 W	00	28	N 44	5 NM	01	0996.5	11.0	4.8					
PRESIDENT WILSON	WNPD	24	46.4 N	146.5 W	00	19	45	5 NM	21	1000.3	13.4	9.4	4	10	18	8	14.5
SEALAND MCLEAN	WMBA	24	43.7 N	163.3 E	06	29	45	10 NM	40	1006.0	3.3	8.3	6	8	30	9	18
WESTWARD VENTURE	KHJB	24	54.9 N	138.2 W	06	16	N 46	5 NM	50	1007.0	7.7	8.3					
PERENNIAL ACE	WDMG	24	54.1 N	171.8 W	06	01	N 41	5 NM	56	0983.8	2.0	5.0					
ARCO ANCHORAGE	WCIG	24	56.1 N	140.6 W	12	18	N 42	5 NM	02	0982.0	7.8	6.1	6	13	22	11	8
EXXON PHILADELPHIA	WNFJ	24	49.2 N	132.9 W	18	17	N 43	2 NM	20	1010.9	12.2	13.4	4	3	15	10	10
NEWARK	WNDQ	24	50.6 N	129.3 W	18	16	45	5 NM	02	1020.0	10.0	10.8	4	6.5	16	8	13
SIMBA	GWEC	24	48.3 N	132.3 W	18	15	N 46	2 NM	61	1012.3	11.9	11.0	5	13	17	9	13
PORTLAND	WNDF	25	56.2 N	143.3 W	11	23	N 43	5 NM	18	0998.5	4.4	7.2	5	6.5	22	10	19.5
PRESIDENT GRANT	WEZD	25	41.4 N	166.9 W	18	30	N 45	2 NM	21	0995.0	7.3	8.3	12	6.5	30	8	6.5
PRINCE OF TOKYO	A8GJ	25	37.7 N	166.2 W	18	28	N 45	1 NM	07	1006.0	11.0	15.0	7	14.5	28	7	14.5
PRESIDENT GRANT	WEZD	26	41.0 N	164.5 W	00	32	N 45	5 NM	18	1004.5	8.9	8.3	1	6.5	32	8	8
RALPH B JOHNSON	6ZDJ	26	33.8 N	138.2 E	00	31	N 52	> 25 NM	02	1009.5	16.0	22.0	12	13	31	< 6	13
NEW CADMUS	5MHI	26	40.0 N	153.1 W	06	26	N 43	.5 NM	02	1010.5	12.0	14.5			25	9	16.5
VAN CONQUEROR	A8TB	26	51.4 N	153.6 W	06	03	N 41	2 NM	61	0980.0	4.0	7.0					
SEALAND LIBERATOR	KHPP	26	38.1 N	145.2 E	06	31	N 49	10 NM	02	1002.0	19.5	22.0	12	32.5	31	13	32.5
TOYOTA MARU 10	JHPI	26	53.5 N	142.4 W	06	12	N 45	2 NM	63	0997.5	7.5	7.0	8	19.5	25	11	16.5
SACRAMENTO	H3DR	26	48.8 N	134.0 W	12	14	N 45	2 NM	65	1004.0	8.0	8.0	9	19.5	16	9	24.5
VAN HAWK	D5ZU	26	45.5 N	148.6 W	12	26	N 60	.25 NM	54	0977.8	7.5	6.0					
SAN DIEGO	WSVR	26	53.2 N	137.4 W	12	16	45	2 NM	20	0998.5	8.9	6.7	6	13	21	7	16.5
BROOKS RANGE	WSRP	26	52.4 N	138.6 W	18	18	50	2 NM	62	0981.5	11.1	9.4	8	18	17	13	16.5
THOMPSON PASS	WSPY	26	57.2 N	142.2 W	18	09	50	2 NM	63	0982.8	6.0	7.9	4	6.5	11	8	29.5
EXXON NEW ORLEANS	WNDM	26	57.5 N	143.0 W	18	18	N 80	2 NM	63	0983.1	5.5	7.2	4	16.5	18	8	32.5

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. 10°	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb.	Temperature °C Air	Temperature °C Sea	Sea Waves* Period sec.	Sea Waves* Height ft.	Swell Waves Dir. 10°	Swell Waves Period sec.	Swell Waves Height ft.
NORTH PACIFIC OCEAN		NOV.															
AMERICA SUN	WNEJ	26	57.5 N	142.3 W	18	10	M 56	.5 NM	07	0996.5	5.0	6.7	7	29.5	10	7	29.5
IRIS ISLAND	JPKE	26	43.5 N	150.7 E	18	02	M 43	1 NM	51	0993.5	5.5	5.0					
MOBILE MERIDIAN	KGSM	26	54.5 N	136.3 W	18	16	M 45	2 NM	63	0979.3	10.6	8.3	6	19.5	18	10	19.5
TONSINA	KJDB	26	57.9 N	143.3 W	18	08	47	2 NM	02	0967.5	5.6	6.1	6	13	09	9	28
EASTERN DIAMOND	HODT	26	42.3 N	147.8 E	20	05	M 51	2 NM	07	1002.5	9.0	10.0	5	8	05	< 6	11.5
ORIENTAL MERCHANT	VRCS	26	48.7 N	143.5 W	21	22	M 50	5 NM	07	0977.7	7.0	6.0	4	10	22	7	52.5
ORIENTAL MERCHANT	VRCS	27	48.9 N	142.9 W	00	25	M 43	2 NM	60	0987.5	7.5	6.0	8	11.5	24	11	36
EXXON BATON ROUGE	WAFA	27	52.9 N	137.9 W	00	18	55	5 NM	60	0984.0	9.0	7.2	8	21	18	8	18
AMERICA SUN	WNEJ	27	58.9 N	144.2 W	00	09	M 55	.5 NM	92	0995.9	6.0	6.7			09	7	29.5
CHEVRON MISSISSIPPI	WXBR	27	51.8 N	140.0 W	00	21	55	.5 NM	82	0969.3	7.5	7.2	6	11.5	20	12	32.5
VAN HAWK	DSZU	27	46.1 N	144.5 W	00	27	M 42	2 NM	50	1000.0	9.0	6.0					
SHUNWIND	ELIQ	27	53.6 N	150.0 W	00	32	M 58	5 NM	61	0968.5	5.0	7.0	8	23			
DIAMOND PHOENIX	DSMS	27	35.3 N	178.3 E	00	08	M 42	2 NM	80	1007.5	14.0	19.0	6	8	09	< 6	6.5
VAN CONQUEROR	ABIB	27	51.1 N	148.1 W	00	28	M 55	1 NM	61	0978.0	4.0	11.0					
KOREAN PRIDE	ELXF	27	49.0 N	140.5 W	00	23	M 48	1 NM	02	0985.0	9.0	9.0	XX	18	23	6	29.5
IRIS ISLAND	JPKG	27	42.6 N	149.6 E	00	09	M 55	50 YD	43	1010.0	5.0	5.0	6	13	09	6	13
SEALAND LIBERATOR	KHRP	27	34.2 N	150.9 E	00	31	M 50	5 NM	02	1000.3	16.0	20.0	12	31	30	13	32.5
MOBILE MERIDIAN	KGSM	27	56.6 N	140.1 W	06	20	M 45	5 NM	01	0959.7	6.1	7.7	6	11.5	18	9	19.5
TOYOTA MARU 10	JKBI	27	53.9 N	148.1 W	06	27	M 50	2 NM	64	0975.5	7.0	6.0	XX	19.5	28	13	23
SAN DIEGO	WSVR	27	53.8 N	136.0 W	06	21	70	2 NM	07	0975.1	7.8	6.7	6	13	22	8	16.5
PRESIDENT PIERCE	WUBV	27	54.0 N	152.0 W	06	29	45	5 NM	01	0984.0	2.7	5.0	6	19.5	29	8	23
PHILADELPHIA	WJGO	27	55.2 N	136.0 W	06	23	50	5 NM	02	0970.9	8.9	10.0	4	11.5	16	< 6	32.5
SEALAND FREEDOM	WGJW	27	36.9 N	153.9 E	12	31	56	2 NM	02	1004.6	15.5	22.0	6	10	31	13	21
PRESIDENT JEFFERSON	WPSE	27	51.0 N	133.8 W	12	23	55	5 NM	02	1001.0	7.8	9.4	13	26			
PRESIDENT HOOVER	WTST	27	35.0 N	178.7 E	12	10	34	5 NM	25	1000.0	16.2	17.8	5	10	09	10	32.5
TYSON LYKES	WSCJ	27	35.7 N	158.9 E	18	36	64	5 NM	52	0998.5	15.6	17.2			31	10	62
EXXON NEW ORLEANS	WNOM	27	56.7 N	140.6 W	18	25	M 65	10 NM	91	0982.6	6.9	5.6	3	10	24	7	32.5
MAERSK NEPTUN	OSWE	27	52.5 N	136.5 W	18	26	50	2 NM	42	1006.0	10.0	8.0	10	13			
WESTWARD VENTURE	KHJB	27	54.7 N	139.9 W	18	25	M 43	10 NM	03	0993.4	4.5	7.2	4	11.5	28	6	31
TONSINA	KJDG	27	55.5 N	140.6 W	18	25	50	10 NM	03	0989.8	6.6	6.1	3	8	24	6	28
SEALAND LIBERATOR	KHPP	28	31.9 N	159.5 E	00	31	M 40	10 NM	02	1009.5	20.0	21.0	14	8	33	>13	36
WESTWARD VENTURE	KNJB	28	53.6 N	139.7 W	00	23	M 32	5 NM	80	1007.0	3.9	7.8	3	10	23	8	32.5
NORSE PILOT	GOVQ	28	28.6 N	170.0 E	00	28	40	10 NM	25	1005.9	23.2	21.0	6	32.5	27	6	19.5
ASIA INDUSTRY	ABGI	28	40.6 N	159.4 E	00	33	M 50	2 NM	02	0998.0	10.0	12.0	10	13	33	>13	23
EXXON NEW ORLEANS	WNOM	28	56.7 N	140.9 W	00	24	M 50	10 NM	03	0992.5	5.5	6.7	4	13	24	6	16.5
TYSON LYKES	WSCJ	28	35.5 N	158.5 E	00	30	62	5 NM	60	1009.0	17.2	17.2	4	14.5	30	8	52.5
MAINE ORE	6ZPT	28	39.1 N	163.4 E	06	31	42	1 NM	80	0991.0	11.5	17.0	9	19.5	28	11	16.5
SEATRAIN YORKTOWN	DSNP	28	29.5 N	172.6 E	06	27	M 42	5 NM	02	1001.0	23.0	22.0	6	11.5			
DIAMOND PHOENIX	DSMS	28	33.6 N	169.5 E	06	27	M 38	2 NM	62	0999.4	18.0	23.0	8	14.5	27	12	32.5
ARTHUR MAERSK	OXRS	28	33.3 N	170.8 E	12	29	50	10 NM	07	0999.0	19.0	22.0	6	13	29	12	29.5
SEALAND MARINER	WGJF	28	34.9 N	168.1 E	12	29	60	5 NM	02	0999.5	16.0	19.0	5	11.5	29	>13	41
PRESIDENT HOOVER	WTST	28	34.8 N	170.5 E	18	33	44	5 NM	07	1000.1	15.6	21.1	9	36	27	9	65.5
PRINCE OF TOKYO	ABEJ	28	37.0 N	176.6 E	18	27	M 35	1 NM	07	0985.0	17.0	18.0	7	36	27	7	36
TOYOTA NO 24	SMTS	28	44.6 N	168.9 W	23	13	M 52	.5 NM	02	1003.0	7.3		4	5	13	9	13
PRESIDENT HOOVER	WTST	29	34.5 N	170.0 E	00	32	40	5 NM	03	1007.3	16.2	21.1	9	41	30	11	49
ARTHUR MAERSK	OXRS	29	33.1 N	168.7 E	00	32	45	10 NM	07	1010.0	19.0	22.0	6	13	32	12	29.5
SEALAND MARINER	WGJF	29	35.1 N	166.5 E	00	32	50	10 NM	03	1012.0	17.0	21.0	5	8	31	>13	41
SIENA	OXFU	29	35.3 N	140.9 E	00	01	M 60	.5 NM	64	1000.0	13.8	17.0	6	26			
PRESIDENT TAFT	WLDT	29	34.5 N	142.0 E	04	35	50	.5 NM	63	0999.0	15.6	22.2	6	24.5	35	8	29.5
PRINCE OF TOKYO	ABGJ	29	37.0 N	175.8 E	06	27	M 49	.5 NM	07	0995.0	19.0	19.0	8	36	27	8	36
VAN HAWK	DSZU	29	46.4 N	126.8 W	06	13	M 42	50 YD	03	0991.5	11.0	9.0					
TIBER	ABWA	29	46.7 N	140.8 W	12	11	M 41	10 NM	03	1014.7	5.5	5.0					
VAN CONQUEROR	ABIB	29	39.7 N	126.5 W	12	27	M 41	1 NM	63	0985.0	6.0	13.0					
TYSON LYKES	WSCJ	29	35.2 N	148.1 E	12	31	45	5 NM	02	1009.4	16.1	17.2					
SEALAND EXCHANGE	KFOU	29	45.2 N	163.5 W	18	11	42	5 NM	63	0997.5	6.9	6.2	5	13	12	11	29.5
SEALAND EXCHANGE	KFOU	30	46.0 N	166.1 W	00	11	45	1 NM	62	0988.0	6.7	5.5	6	14.5	11	11	29.5
ARCO ANCHORAGE	WCIO	30	48.0 N	131.7 W	00	30	M 43	5 NM	02	1002.2	8.3	8.3	6		28	12	16.5
DIAMOND PHOENIX	DSMS	30	33.2 N	158.4 E	00	24	M 52	5 NM	01	1001.5	21.8	22.0	8	11.5	23	9	19.5
SHUNWIND	ELIQ	30	54.5 N	169.8 W	06	14	M 42	10 NM	02	1003.8	5.5	6.0	6	13	12	7	16.5
MILLER FREEMAN	WTDH	30	57.5 N	137.4 W	06	07	M 38	10 NM	03	1013.5	1.0	9.1	8	16.5	24	8	39
JAPAN CAOBO	SMKV	30	34.2 N	164.9 E	06	21	45	10 NM	03	1005.0	21.0	20.0	6	10	20	8	16.5
SEALAND MARINER	WGJF	30	35.0 N	157.2 E	06	26	56	5 NM	02	0995.0	15.5	18.0	6	16.5	26	8	41
ORIENTAL STATESMAN	ELPE	30	38.5 N	155.3 E	06	35	M 70	200 YD	02	0989.0	12.0	17.0					
PRESIDENT HOOVER	WTST	30	34.6 N	159.9 E	12	27	45	2 NM	02	1003.0	15.0	18.3	6	16.5	25	9	32.5
ARTHUR MAERSK	OXRS	30	32.4 N	156.0 E	12	28	45	5 NM	25	1010.8	18.5	22.0	6	16.5	29	12	29.5
ENVIRONMENTAL BUOYS																	
46003		17	52.0 N	156.0 W	18	23	M 41			982.4	5.3	6.8					
46003		18	52.0 N	156.0 W	04	25	M 42			987.8	3.7	6.9					
46003		34	52.0 N	156.0 W	22	24	M 41			984.6	4.2	6.2					
46003		25	52.0 N	156.0 W	01	26	M 42			987.6	4.5	6.1					
46004		15	51.0 N	136.0 W	23	16	M 47			996.6	11.1	10.1					
46004		16	51.0 N	136.0 W	01	16	M 49			992.3	11.0	10.1					
46004		26	51.0 N	136.0 W	21	20	M 45			984.8	10.7	9.1					
46004		27	51.0 N	136.0 W	00	21	M 48			985.0	9.4	9.0					
		DEC.															
MOBILE MERIDIAN	KGSM	1	54.0 N	135.8 W	00	05	M 56	10 NM	03	1013.0	5.0	8.7	3	3	05	13	6.5
SARGODHA	OUIU	1	32.0 N	154.3 E	06	29	M 42	> 25 NM	02	1007.0	20.0	18.0	5	13			
PRINCE OF TOKYO	ABEJ	1	33.0 N	170.1 E	06	26	M 41	5 NM	07	1005.0	23.0	21.0	8	29.5	24	8	29.5
JAPAN CAOBO	SMKV	1	36.9 N	174.5 E	12	25	50	10 NM	03	0996.5	19.0	17.0	8	13	25	10	19.5
PACIFIC HIGHWAY	JLJL	1	46.1 N	152.7 W	18	07	M 41	1 NM	21	0997.0	9.0	7.0	6	10	06	10	14.5
PRESIDENT KENNEDY	KCAK	2	38.3 N	179.9 W	00	22	45	5 NM	02	0988.0	14.0	14.4	3	13	24	6	23
CHEVRON ARIZONA	WGBE	2	40.6 N	125.2 W	00	16	M 47	.25 NM	66	1007.1	12.8		3	10	16	8	16.5
PACIFIC HIGHWAY	JLJL	2	46.6 N	150.2 W	00	06	M 47	10 NM	02	1005.0	8.0	7.0	5	10	07	9	16.5
SIENA	OXFU	2	42.7 N	156.3 E	06	04	M 46	5 NM	25	1014.5	7.2	15.5	7	23	08	9	19.5
ORIENTAL MERCHANT	VRCS	2	43.1 N	124.8 W	12	16	M 55	200 YD	65	0992.0	13.0	9.0					
AMERICA SUN	WNEJ	2	39.9 N	125.3 W	12	18	M 45	2 NM	02	1000.2	13.3	12.8	6	16.5	20	6	16.5
JAPAN CAOBO	SMKV	2	37.6 N	178.0 W	12	32	45	2 NM	55	0994.0	14.0	16.0					
PACIFIC HIGHWAY	JLJL	3	47.5 N	140.2 W	12	36	M 50	10 NM	25	1006.5	6.5	8.0					
NORSE PILOT	GOVQ	4	31.6 N	137.0 E	00	27	45	5 NM	02	1012.2	19.0	20.0	7	46	28	9	26
OCEAN LOE	GJLF	4	42.0 N	151.3 E	00	14	M 45	1 NM	02	1011.0	9.0	10.0	3	11.5	14	< 6	13
SEALAND EXCHANGE	KFOU	4	38.4 N	153.3 E	06	16	45	5 NM	03	1008.8	15.5	15.5	5	10	16	9	16.5
SARGODHA	OUIU	4	27.6 N	173.0 W	06	16	M 29	10 NM	01	1002.5	22.5	21.0	4	1.5	16	6	32.5
SEALAND TRADE	WEUI	4	47.7 N	132.6 W	18	34	45	10 NM	02	1006.0	6.7	10.0	3	5	35	10	24.5
SHUNWIND	ELIQ	4	48.5 N	156.0 E	18	13	M 50	5 NM	63	1012.5	3.5	4.0	8	19.5			
PACIFIC VENTURE	HOVS	4	47.6 N	157.0 E	22	13	M 42	.5 NM	81	1017.0	5.0	4.0	6	19.5	13	7	26
PACIFIC VENTURE	HOVS	5	47.2 N	156.6 E	00	14	M 48	.5 NM	81	1014.0	5.0	4.0	6	23	14	8	26
ALATON STAR	HBLI	5	47.7 N	156.4 E	00	15	M 35	2 NM	53	1013.0	5.0	4.0	5	29.5	15	12	34.5
ORIENTAL SOVEREIGN	ABUM	5	54.1 N	172.1 W	00	05	M 45	.25 NM	80	1007.0	7.0	4.5	8	19.5	05	9	13
PRESIDENT JEFFERSON	WPSE	5	54.0 N	172.1 W	00	04	55	5 NM	02	1006.0	3.3	3.3	12	24.5			
PRESIDENT VAN BUREN	WWPI	5	25.3 N	168.3 W	00	25	45	2 NM	10	0997.5	22.8	24.0	10	24.5	25	>13	19.5
SHERMAN WHEC 720	NHHJ	5	54.4 N	170.7 W	06	05	M 47	5 NM	61	1010.5	3.5	6.0	7	16.5			
PRESIDENT CLEVELAND	WGXA	5	53.0 N	179.1 E	06	05	45	2 NM	02	1017.0	7.2	3.3	6	13	05	10	23

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. pts	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C Air	Temperature °C Sea	Sea Waves* Period sec.	Sea Waves* Height ft.	Swell Waves Dir. pts	Swell Waves Period sec.	Swell Waves Height ft.
NORTH PACIFIC OCEAN		DEC.															
SIENA	OXFU	5	46.7 N	178.8 E	11	34	M 56	10 NM	86	0998.3	4.0	10.5	7	29.5			
NEPTUNE AMBER	S6CY	5	43.8 N	179.8 W	12	30	M 44	2 NM	77	1001.0	5.0		4	13	33	10	19.5
PRESIDENT JEFFERSON	WP8E	5	53.2 N	178.8 W	12	04	55	2 NM	73	1011.9	0.8	3.3	12	24.5			
TOWNSEND CROMWELL	WTDF	5	25.6 N	170.6 W	12	33	M 45	10 NM	02	1006.8	21.2	22.9	3	8	30	8	19.5
PRESIDENT JEFFERSON	WP8E	6	52.3 N	174.8 E	00	04	42	5 NM	02	1019.1	2.2	2.8	6	19.5	06	>13	26
MOBILE MERIDIAN	KGSM	6	51.6 N	131.0 W	00	35	M 45	> 25 NM	02	1016.0	5.0	8.8	7	3	35	8	10
VAN TRIUMPH	6ZJP	6	53.6 N	155.0 W	12	11	M 45	5 NM	53	0999.0	6.5	6.5					
SHERMAN WHEC 720	NMMJ	6	52.0 N	176.1 W	18	01	M 70	.5 NM	73	0985.1	0.9	4.8	3	5			
JARVIS WHEC 725	NAGD	6	58.9 N	176.7 W	18	06	M 44	2 NM	79	1027.8	1.9	7.4	10	31			
SHERMAN WHEC 720	NMMJ	7	52.0 N	176.1 W	00	01	M 60	.5 NM	73	0982.7	1.2	4.6	3	6.5			
SILVER PHOENIX	D5NW	7	48.0 N	175.1 W	00	36	M 50	1 NM	03	0963.5	4.5	4.8			36	>13	16.5
PORTLAND	WNDF	7	58.5 N	149.7 W	12	07	M 42	5 NM	21	1004.0	3.9	6.1	7	18			
JARVIS WHEC 725	NAGD	7	59.0 N	175.7 W	12	06	M 45	2 NM	07	1013.1	0.2	3.8	10	32.5			
WESTWARD VENTURE	KHJB	8	54.4 N	137.1 W	00	27	M 44	.25 NM	28	1000.5	6.5	7.5	4	8	27	< 6	13
VAN TRIUMPH	6ZJP	9	52.1 N	172.7 W	00	01	M 45	5 NM	03	0985.5	5.0	6.5					
JARVIS WHEC 725	NAGD	10	56.2 N	170.9 W	12	07	M 42	5 NM	07	1001.5	4.0	3.9	10	8			
PACIFIC HIGHWAY	JLJL	11	45.2 N	134.9 W	06	20	M 46	10 NM	02	1006.4	15.0	10.5	6	10	24	10	16.5
KOREAN LEADER	D7XX	12	39.9 N	159.6 W	00	27	M 42	5 NM	02	0991.0	10.0	11.0	7	10	27	< 6	14.5
PRESIDENT TYLER	WE7M	12	36.5 N	137.7 W	06	20	M 41	5 NM	01	1012.2	15.0	13.3	3	5	22	10	13
FRIENDSHIP	ELXP	12	47.2 N	158.7 W	06	04	M 43	2 NM	43	0986.0	7.0	8.0	5	10	04	7	11.5
LNG CAPRICORN	KHLN	12	26.4 N	129.5 E	06	30	M 42	10 NM	02	1012.0	16.5	26.7	5	11.5	05	6	13
ASHLEY LYKES	WBAE	12	38.1 N	161.2 E	12	01	45	10 NM	02	1022.7	11.7	16.7	3	6.5	36	< 6	10
ORIENTAL MERCHANT	VRCS	12	29.9 N	177.5 E	12	30	M 45	5 NM	01	1001.5	19.0	18.0					
YOUNG SEAGULL	6ZDN	12	44.5 N	156.2 W	12	31	M 42	2 NM	62	0989.0	11.0	9.0					
SOUTH EXPRESS	A8WR	12	48.1 N	150.6 E	18	13	M 48	.25 NM	65	1008.0	2.0	5.0					
WESTWARD VENTURE	KHJB	12	53.2 N	134.4 W	18	24	M 35	> 25 NM	03	1004.0	6.1	7.8	4	10	24	9	32.5
WESTWARD VENTURE	KHJB	13	51.9 N	132.0 W	00	26	M 27	> 25 NM	01	1015.0	8.5	7.8	4	10	24	9	32.5
PACIFIC ERA	ELUQ	13	33.7 N	150.1 E	00	17	45	2 NM	80	1007.5	19.0	21.0	XX	16.5	18	12	19.5
STREAM BOLLARD	ELYM	13	43.0 N	152.0 E	00	15	M 56	1 NM	62	1000.5	9.0	7.0	6	16	19	9	24.5
SOUTH EXPRESS	A8WR	13	44.4 N	149.1 E	00	24	M 45	.25 NM	65	0993.0	11.0	6.0	5	13	24	8	13
SEATRAIN YORKTOWN	D5NP	13	37.7 N	157.2 W	00	14	M 42	200 YD	44	0996.8	14.2	13.0	5	6	13	8	11.5
PACMERCHANT	5MCB	13	45.0 N	150.3 E	00	13	M 58	2 NM	58	0995.0	3.5	3.0	4	16.5	13	12	24
ORIENTAL MERCHANT	VRCS	13	29.8 N	174.5 E	00	32	M 43	5 NM	01	1008.5	17.0	19.0	4	8	31	>13	29.5
MUNRO WHEC 724	NGDF	13	27.2 N	173.8 W	06	28	M 45	2 NM	07	0998.1	18.5	22.5	6	16.5			
PERENNIAL ACE	HOMQ	13	42.0 N	149.7 W	09	13	M 43	2 NM	65	0994.5	11.0	10.5	6	8	14	9	11.5
DAFFODIL	H3AG	13	52.6 N	150.6 W	12	36	M 45	5 NM	02	0985.9	4.5	7.0	5	10	36	8	16.5
ASHLEY LYKES	WBAE	13	39.5 N	169.8 E	12	01	45	10 NM	02	1017.3	8.9	14.4	3	6.5	04	< 6	10
PRESIDENT GRANT	WE7D	13	46.7 N	154.2 E	12	15	M 46	.25 NM	51	1089.5	4.4	8.6	2	6.5			
VAN TRIUMPH	6ZJP	13	47.6 N	156.1 E	12	13	M 58	1 NM	59	0999.0	4.8	5.0					
ANDERS MAERSK	OXIT	13	41.4 N	142.5 E	18	23	44	1 NM	22	0999.7	4.0						
GREAT OCEAN	JKJT	13	33.6 N	176.4 W	18	31	M 45	5 NM	03	0995.0	11.0	18.8	6	16.5	31	6	16.5
BLUE OCEAN	JKOH	13	42.9 N	150.8 E	18	22	M 45	2 NM	87	0996.0	4.0	3.0	7	13	22	7	14.5
MAYA PIONEER	JLAX	13	43.8 N	150.4 E	18	25	M 55	2 NM	81	0993.3	4.9	4.0	6	18		6	18
SEALAND LIBERATOR	KHRP	13	42.8 N	145.2 W	18	17	M 45	5 NM	51	0992.0	14.0	11.0	6	23	17	6	23
TOYOTA MO 24	5MTS	13	41.7 N	143.5 W	21	18	M 49	1 NM	48	1000.5	15.3		2	3	26	7	10
GOLDEN ROD	5MZC	14	49.5 N	137.5 W	00	14	M 44	.25 NM	44	0993.5	10.5	8.6	8	18	15	12	18
SEATRAIN YORKTOWN	D5NP	14	38.0 N	148.9 W	00	18	M 41	1 NM	42	0997.1	19.0	14.0	9	21	19	12	24.5
VAN FORT	D5DW	14	48.4 N	139.6 W	00	20	M 44	1 NM	56	0993.0	11.5	8.0					
MUNRO WHEC 724	NGDF	14	27.5 N	176.6 W	00	32	M 45	5 NM	02	1007.0	18.3	22.5	10	21			
MAYA PIONEER	JLAX	14	43.2 N	149.6 E	00	24	M 58	10 NM	05	0993.3	4.5	4.0	7	24.5	24	6	26
MOHSING BREEZE	3EOU	14	41.9 N	143.8 E	03	23	M 55	< 50 YD	41	0999.4	0.0	6.5	7	13	23	6	13
CHESNUT HILL	WVFX	14	34.2 N	152.2 W	05	17	45	1 NM	82	0992.0	20.6	16.7	9	24.5	XX	9	26.5
MANHATTAN	WJAF	14	56.0 N	139.2 W	12	31	50	10 NM	01	0985.7	5.0	7.7	5	10	30	8	13
PRESIDENT GARCIA	DVFL	14	36.2 N	147.4 W	12	32	42	2 NM	58	1009.8	18.0	17.0	8	24	28	9	16.5
STREAM BOLLARD	ELYM	14	40.1 N	147.6 E	12	27	M 42	5 NM	03	0999.5	5.0	13.0					
BLUE OCEAN	JKOH	14	41.3 N	148.6 E	18	25	M 45	2 NM	74	0993.5	4.0	5.8	7	13	25	8	18.5
SINALOA	OXNS	14	37.4 N	148.8 E	18	23	M 44	10 NM	02	1000.3	10.0	19.5	6	16.5			
EASTERN TREASURE	6ZSP	14	44.6 N	147.6 W	21	17	M 53	1 NM	07	0989.0	12.5	9.0	8	26	18	10	29.5
EASTERN TREASURE	6ZSP	15	44.8 N	147.0 W	00	21	M 54	2 NM	02	0992.0	12.5	9.0	9	23	20	11	36
PACMERCHANT	5MCB	15	41.7 N	142.5 E	00	29	M 54	10 NM	01	0997.0	9.0	13.0	6	6.5	29	12	16.5
PRESIDENT GRANT	WE7D	15	39.5 N	144.9 E	06	30	M 52	5 NM	26	0998.8	5.6	4.4	3	6.5	27	7	11.5
MAYA PIONEER	JLAX	15	39.2 N	147.0 E	06	31	M 50	5 NM	26	0999.1	5.0	14.0	7	19.5	31	7	19.5
STREAM BOLLARD	ELYM	15	39.0 N	149.5 E	06	26	M 45	10 NM	24	0999.0	6.0	7.0	5	10	26	9	19.5
ORIENTAL MERCHANT	VRCS	15	30.6 N	156.2 E	12	25	M 45	10 NM	02	1006.0	21.0	19.0			28	7	24.5
VAN HAWK	D5ZU	15	51.0 N	165.9 E	12	09	M 41	1 NM	51	0978.0	3.0	1.0					
SEATRAIN INDEPENDENCE	D5KL	15	35.8 N	155.8 E	22	27	50	5 NM	18	1003.0	11.0	16.0	9	14.5	27	10	23
VAN TRIUMPH	6ZJP	16	42.2 N	149.1 E	00	30	M 45	5 NM	94	1002.0	3.5	6.5					
TOYOTA MARU 10	JK8I	16	43.1 N	175.2 W	00	13	M 50	.5 NM	03	1003.5	10.0	7.0	8	13	13	10	14.5
SEATRAIN INDEPENDENCE	D5KL	16	35.0 N	155.0 E	02	27	50	5 NM	88	1005.5	14.0	18.0	9	16.5	27	10	26
PRINCE OF TOKYO	A8GJ	16	48.2 N	178.5 W	06	11	M 44	200 YD	07	0990.0	4.0	5.8	9	26	11	9	26
JUTHLANDIA	ELXV	16	43.0 N	148.5 E	12	26	45	5 NM	77	1007.0	1.0	2.3					
SEALAND LIBERATOR	KHRP	16	49.8 N	174.5 W	12	13	M 50	.5 NM	81	0998.8	4.0	5.0					
CHARLES LYKES	KLMR	16	48.2 N	173.4 W	18	13	55	200 YD	44	0983.4	3.6	2.8	10	24.5	15	10	24.5
DAFFODIL	H3AG	16	53.8 N	175.6 W	18	11	M 49	2 NM	02	1000.5	5.5	5.8	9	23	12	10	19.5
CALIFORNIA RAINBOW	JNJL	16	52.3 N	177.3 W	18	13	M 51	2 NM	09	0990.0	3.0	6.0	4	6.5	13	8	10
PRESIDENT PIERCE	WURV	16	49.7 N	177.4 W	18	16	45	2 NM	63	0981.0	3.3	3.3	6	23	14	7	24.5
PRESIDENT HARRISON	WCJI	16	44.2 N	174.3 W	18	17	45	1 NM	61	0987.0	6.3	6.1	6	23	14	10	16.5
VICTORIOUS	3FYC	16	54.6 N	179.8 W	20	09	M 50	2 NM	26	0994.0	4.8						
OCTA	A8OG	16	52.8 N	177.6 E	21	11	M 47	1 NM	02	0976.5	4.8	4.5	10	24.5			
OCTA	A8OG	17	52.7 N	178.5 E	00	11	M 50	2 NM	02	0969.0	4.5	4.5	10	26			
PRINCE WILLIAM SOUND	WSDX	17	57.4 N	142.0 W	00	27	M 41	5 NM	16	1025.5	0.0	4.7	8	10	27	9	13
PRESIDENT HARRISON	WCJI	17	44.2 N	172.5 W	00	17	45	1 NM	60	0992.3	6.3	6.1	6	16.5	14	10	19.5
CALIFORNIA RAINBOW	JNJL	17	52.3 N	179.5 W	00	14	M 41	< 50 YD	45	0981.0	8.0	6.0	6	10	14	6	14.5
PRESIDENT KENNEDY	KCAN	17	51.8 N	170.9 W	00	14	43	5 NM	02	1010.2	4.4	4.4	2	10	14	8	24.5
DAFFODIL	H3AG	17	53.6 N	177.6 W	00	11	M 45	2 NM	02	0991.0	7.0	5.8	10	23	12	10	23
WISTERIA	JJBD	17	53.8 N	178.0 W	00	12	M 52	.5 NM	40	0991.4	5.0	4.5	10	19.5	12	10	19.5
TOYOTA MARU 10	JK8I	17	43.5 N	170.5 W	00	13	M 46	1 NM	02	0998.5	11.0	9.0	8	13	13	11	16.5
CHARLES LYKES	KLMR	17	48.6 N	173.3 W	00	19	60	200 YD	44	0991.0	3.3	2.2	9	19.5	14	10	19.5
SEALAND LIBERATOR	KHRP	17	49.9 N	177.5 W	00	13	M 50	5 NM	05	0998.5	4.0	4.0	5	6	16	10	14.5
MOBILE MERIDIAN	KGSM	17	56.4 N	139.0 W	00	30	M 45	5 NM	24	1026.0	1.6	8.9	3	5	30	6	10
SUNNY PIONEER	H3SY	17	43.7 N	156.5 E	06	30	M 46	5 NM	01	0993.0	5.0	8.8	7	18	30	7	18
TRIUMPH	3EZZ	17	54.4 N	172.3 W	06	16	M 52	2 NM	02	1010.0	1.0	4.0	12	16.5	16	12	16.5
TRIUMPH	3EZZ	18	55.1 N	177.4 W	00	16	M 58	2 NM	58	1007.8	3.0	2.6	10	14.5	16	10	14.5
PRESIDENT TAYLOR	WJSH	18	53.9 N	172.6 W	00	13	58	5 NM	03	1014.5	2.8	3.9	7	11.5	17	>13	24.5

Vessel	Nationality	Date	Position of Ship		Time GMT	Wind		Visibility n. mi.	Present Weather code	Pressure mb.	Temperature °C		Sea Waves*		Swell Waves		
			Lat. deg.	Long. deg.		Dir. 10°	Speed kt.				Air	Sea	Period sec.	Height ft.	Dir. 10°	Period sec.	Height ft.
NORTH PACIFIC OCEAN		DEC.															
GREAT OCEAN	JKJT	19	33.5 N	153.4 E	00	27	M 42	10 NM	03	1015.0	18.0	20.0	5	10	27	< 6	10
SIMBA	OWEC	19	32.8 N	160.8 W	12	21	M 42	5 NM	82	0998.0	16.6	16.0	4	10			
SEALAND MARINER	KGJF	19	40.6 N	167.0 E	18	12	45	5 NM	63	0998.9	12.0	13.0	4	10	XX		10
ORIENTAL SOVEREIGN	ABUH	20	44.6 N	165.1 E	00	09	M 42	.25 NM	61	0999.0	8.0	7.0	7	21	00		0
SEALAND LIBERATOR	KHRP	20	42.0 N	152.0 E	06	28	M 47	5 NM	86	0990.3	2.5	3.0	6	8	30	7	10
SEALAND LIBERATOR	KHRP	21	39.8 N	148.5 E	00	32	M 44	5 NM	02	1004.5	4.0	13.0	4	8	32	< 6	8
PRESIDENT KENNEDY	KCAN	21	44.3 N	149.5 E	00	27	47	2 NM	75	0993.2	3.3	2.2	3	10	27	6	16.5
GOLDEN PRINCE	6ZCU	21	38.4 N	153.5 E	00	31	M 47	2 NM	03	1000.3	4.7	19.0	10	19.5	31	9	16.5
CALIFORNIA RAINBOW	JNJL	21	43.4 N	150.1 E	06	30	M 45	2 NM	02	0995.0	1.0	4.0	3	6.5	30	6	14.5
WASHINGTON WOOD	JEOV	21	54.3 N	168.2 W	12	09	50	2 NM	12	1000.0	5.0	4.8	8	16.5	09	8	16.5
SEALAND EXCHANGE	KFOU	21	39.5 N	155.6 E	12	27	45	10 NM	02	0990.7	5.6	11.1	4	6.5	27	10	18
SEATRAIN ORISKANY	DSOM	21	29.5 N	167.7 W	12	25	M 50	5 NM	02	0998.9	19.5	20.0	6	13	XX		19.5
GOLDEN PRINCE	6ZCU	22	38.4 N	160.3 E	00	31	M 41	2 NM		0993.9	8.5	16.0	7	24.5	31	>13	24.5
JARVIS WMEC 725	NAQD	22	26.5 N	156.7 W	00	23	M 34	2 NM	63	1000.4	24.9	22.3	7	10			
TRANSCOLUMBIA	KPGQ	22	37.0 N	140.9 W	18	16	41	2 NM	64	1002.1	17.3	16.1	7	6.5	16	9	14.5
WASHINGTON WOOD	JEOV	22	54.2 N	164.7 W	18	09	M 45	5 NM	58	1004.0	3.5	5.0	10	14.5	09	10	14.5
MAUI	WSLH	22	27.8 N	147.2 W	18	20	M 45	5 NM	02	1008.8	21.1	21.1	7	11.5	28	8	8
SIMBA	OWEC	23	26.5 N	178.0 E	00	25	M 50	10 NM	01	1004.8	23.2	21.5	4	3	28	< 6	3
EVER SPRING	HJWZ	23	36.0 N	171.6 E	06	31	M 42	5 NM	02	0994.7	12.3	16.0	5	10	31	11	13
ARCO SAG RIVER	WLDF	23	43.0 N	132.5 W	12	14	M 46	5 NM	63	1005.0	12.8	11.7	7	11.5	14	7	11.5
ARCO FAIRBANKS	WGWB	23	52.0 N	136.0 W	18	10	M 43	5 NM	61	1002.5	5.6	5.6	7	10	12	9	26
OCEAN LOG	8JLF	23	52.8 N	153.8 W	18	09	M 43	> 25 NM	03	1000.0	2.0	4.5	8	6.5	09	8	14.5
PAN IVORY	D7QY	23	52.5 N	145.0 W	18	07	M 46	5 NM	62	0995.5	3.0	7.0	12	18	07	< 6	
WASHINGTON WOOD	JEOV	23	52.0 N	162.3 W	18	09	M 45	2 NM	62	0983.0	2.5	3.6	10	14.5	09	10	14.5
JAMAICA MARU	JGIO	23	33.0 N	174.2 W	18	29	M 42	5 NM	41	0996.2	15.0	17.5	4	16.5	28	9	18
MAUNALEI	KSVE	23	33.0 N	147.3 W	18	27	45	5 NM	02	1001.5	18.3	18.9	3	6.5	26	11	16.5
IRIS ISLAND	JPKG	24	48.5 N	154.3 W	00	07	M 45	50 YD	11	0961.0	6.0	6.0	12	32.5	08	>13	36
WASHINGTON WOOD	JEOV	24	51.2 N	162.0 W	00	05	45	.5 NM	41	0987.0	3.0	4.0	12	19.5	05	12	19.5
SEATRAIN YORKTOWN	DSNP	24	29.5 N	155.1 W	00	20	M 51	.25 NM	25	0991.0	22.0	20.0	11	16.5			
OCEAN LOG	8JLF	24	54.3 N	156.5 W	00	06	M 45	5 NM	02	0996.5	1.0	4.5	10	23	06	13	24.5
CRESSIDA	3FTB	24	35.9 N	143.6 E	00	23	M 41	5 NM	02	0986.0	15.0	21.6	6	13	23	6	14.5
TRIUMPH	3E7Z	24	39.1 N	142.4 E	00	05	M 46	1 NM	10	0995.0	0.0	5.0	8	16.5	08	8	16.5
ARCO FAIRBANKS	WGWB	24	51.2 N	134.8 W	00	14	M 43	1 NM	10	0994.6	8.3	6.7	7	13	12	9	21
NEWARK	WNDO	24	56.5 N	143.9 W	00	08	45	5 NM	70	1008.5	1.1	5.6	5	10	08	7	19.5
SEALAND MCLEAN	WH6A	24	30.7 N	130.5 E	05	32	45	5 NM	05	1007.8	12.3	19.4	4	6.5	31	8	19.5
PAN IVORY	D7QY	24	53.0 N	149.6 W	06	07	M 42	.25 NM	45	0987.5	3.0	6.0			05		
SKAUGRAN	LMUK	24	37.9 N	149.8 E	06	11	50	5 NM	21	0990.0	11.8		9	19.5			
SEALAND PATRIOT	KHRF	24	35.1 N	144.0 E	06	26	M 45	10 NM	01	0981.2	14.0	19.0	6	32.5	30	6	24.5
MING GALAXY	BLHW	24	29.4 N	145.3 W	12	19	M 45	5 NM	50	1006.5	21.8	21.0	12	23			
PRESIDENT GARCIA	DVEL	24	33.3 N	157.8 E	12	10	M 42	.25 NM	50	0999.5	15.0	13.0	7	8	12	6	10
ZOELLA LYKES	WELN	24	32.8 N	149.1 W	12		50	5 NM	25	0999.4	18.8	18.8	5	8	24	< 6	13
MARCONA TRANSPORTER	ELUQ	25	29.2 N	139.1 E	00	33	41	> 25 NM	02	1009.0	18.0	23.0	7	13	33	11	19.5
IRIS ISLAND	JPKG	25	48.7 N	149.7 W	00	27	M 25	10 NM	01	0982.0	7.0	6.0	4	6.5	10	>13	32.5
SEATRAIN INDEPENDENCE	DSKL	25	33.6 N	154.3 E	04	27	45	5 NM	02	0998.1	16.0	21.0	8	16.5	24	13	26
SEALAND FINANCE	WJKG	25	41.0 N	144.6 E	06	36	44	2 NM	02	1002.5	2.8	4.4	8	26	04		19.5
PRESIDENT HOOVER	WTST	25	41.2 N	145.6 W	06	23	48	2 NM	07	0998.1	10.0	12.2	7	18	23	9	29.5
PRESIDENT GARCIA	DVEL	25	33.4 N	152.8 E	12	27	M 42	2 NM	07	0991.0	15.5	13.0	11	13	26	6	16.5
EVER SHINE	HPET	25	27.4 N	159.8 E	12	27	M 46	5 NM	02	1006.5	22.5	23.0	8	11.5	27	9	16.5
MING GALAXY	BLHW	25	27.1 N	154.5 W	18	26	M 36	5 NM	07	1005.0	21.0	23.0	6	16.5	26	11	32.5
CRESSIDA	3FTB	25	38.4 N	153.1 E	18	29	M 48	5 NM	02	0988.0	12.0	17.8	7	26	29	7	26
AMERICAN LEGION	WZJC	25	35.3 N	154.8 E	18	34	45	10 NM	81	0990.2	13.9	17.2					
SHUNWIND	ELIQ	25	36.9 N	158.1 E	21	28	M 42	10 NM	07	0984.0	14.5	16.0	5	8	28	7	21
SEATRAIN ORISKANY	DSOM	26	28.7 N	164.8 E	06	28	M 32	5 NM	03	1006.0	20.0	22.0	5	11.5	29	12	32.5
MING GALAXY	BLHW	26	27.0 N	157.9 W	06	30	M 15	5 NM	07	1010.5	19.0	22.5	6	16.5	27	10	32.5
AMERICAN LEGION	WZJC	26	35.1 N	158.7 E	06	29	45	10 NM	02	0998.0	14.4	17.2	10	32.5	28	12	32.5
CRESSIDA	3FTB	26	38.0 N	156.1 E	06	29	M 48	5 NM	02	0994.0	17.0	18.7	7	26	29	7	26
SEALAND PATRIOT	KHRF	26	38.6 N	164.6 E	06	27	M 41	10 NM	28	0981.0	14.0	15.0	6	19.5	24	11	26
AMERICAN TRADER	KVKV	26	44.4 N	125.5 W	06	18	45	5 NM	64	1013.9	13.3	11.1	5	11.5	18	9	19.5
PRESIDENT HOOVER	WTST	26	38.9 N	134.2 W	12	18	48	2 NM	68	0998.3	16.2	15.6	8	19.5			
ARCO FAIRBANKS	WGWB	26	44.4 N	129.7 W	12	21	M 47	1 NM	02	1003.1	14.0	10.0			21	8	24.5
OCTA	ABOG	26	30.9 N	131.3 E	12	31	M 43	2 NM	60	1020.5	9.0	21.0	7	14.5			
WESTWARD VENTURE	KHJB	26	49.9 N	128.3 W	18	19	M 28	1 NM	63	0993.6	10.0	8.3	5	19.5	21	9	32.5
ORIENTAL EXPORTER	WRCN	27	48.2 N	126.3 W	00	18	M 44	1 NM	61	0997.0	11.6	11.5	4	16.5	18	8	23
AMERICAN LEGION	WZJC	27	34.8 N	145.1 E	00	31	45	5 NM	15	1001.0	14.0	17.8	10	32.5	29	12	32.5
SIENA	OXFU	27	47.7 N	135.3 W	06	25	M 52	10 NM	02	0994.0	9.8	16.5	8	16.5			
EVER SHINE	HPET	27	29.7 N	149.1 E	06	27	M 41	5 NM	02	1004.5	19.5	21.0	7	13	28	7	16.5
STREAM BOLLARD	ELYM	27	33.9 N	141.3 E	12	27	M 41	10 NM	60	1002.4	8.0	22.0	6	10	31	8	10
LNG CAPRICORN	KHLN	28	30.5 N	135.7 E	06	29	M 47	10 NM	50	1006.0	11.0	22.2	6	18	29	13	18
EVER SHINE	HPET	28	31.7 N	142.2 E	18	28	M 45	5 NM	04	1005.5	12.0	20.0	7	14.5	28	8	19.5
MARCONA EXPORTER	ELFC	28	29.3 N	156.3 E	18	28	41	10 NM	01	1005.5	20.0	22.0	10	23	29	13	24.5
EVER SHINE	HPET	29	32.1 N	141.1 E	00	29	M 48	5 NM	02	1007.5	11.2	20.0	8	16.5	29	9	21
OLGA MAERSK	OUXW	29	48.2 N	135.3 W	06	20	47	2 NM	58	0997.5	14.4				20	8	24.5
MARCONA EXPORTER	ELEC	29	29.5 N	154.6 E	06	26	50	10 NM	03	1005.0	20.5	21.0	10	29.5	24	13	29.5
TRANSCOLORADO	KOEW	29	31.6 N	136.4 E	12	29	42	10 NM	02	1012.2	10.0	16.7	7	14.5	29	9	16.5
STREAM BOLLARD	ELYM	29	36.7 N	155.6 E	18	27	M 45	5 NM	18	0990.0	9.0	18.0					
SEATRAIN ORISKANY	DSOM	29	33.1 N	151.4 E	18	27	M 50	5 NM	01	0999.0	18.5	20.0	6	13	27		26
CRESSIDA	3FTB	29	41.9 N	179.4 W	18	27	M 41	5 NM	02	0984.0	8.0	12.2	6	14.5	27	7	16.5
AMERICAN LEGION	WZJC	30	36.5 N	163.2 W	00	26	36	5 NM	25	0982.7	18.3	13.3	2	19.5	26	>13	44
SEATRAIN ORISKANY	DSOM	30	33.2 N	151.1 E	00	27	M 50	5 NM	01	1001.0	15.0	18.0	6	14.5	27		29.5
MARCONA EXPORTER	ELEC	30	29.8 N	153.1 E	00	28	50	10 NM	01	1008.3	20.5	21.0	9	29.5	28	13	29.5
MARCONA EXPORTER	ELEC	31	29.9 N	150.5 E	00	29	48	10 NM	80	1011.3	19.0	20.0	8	26	30	10	26
AMERICAN LEGION	WZJC	31	37.0 N	154.8 W	00	26	38	10 NM	02	0993.9	12.8	13.3	6	19.5	27	10	36
OLGA MAERSK	OUXW	31	53.3 N	148.7 W	06	11	42	1 NM	10	0985.5	9.4	6.0	5				
ALASKA STANDARD	WHDN	31	59.3 N	150.2 W	12	11	45	2 NM	68	0992.5	6.3	7.8	5	6.5	12	< 6	11.5
GOLDEN PRINCE	6ZCU	31	47.1 N	155.4 W	18	12	M 41	.25 NM	10	1010.6	10.0	9.0	6	16.5	12	< 6	19.5
ENVIRONMENTAL BUOYS																	
46002		31	42.5W	130.0W	19	25	M42			994.5	12.8	12.9	5	17			
46003		12	52.0N	156.0W	22	02	M44			991.2	0.2	3.3					
46003		13	52.0N	156.0W	00	01	M44			990.1	-0.5	5.5	4	13			
46003		17	52.0N	156.0W	22	07	M43			1016.0	2.3	5.1					
46003		18	52.0N	156.0W	04	06	M45			1008.7	2.3	5.1	5	17			
46003		23	52.0N	156.0W	15	05	M47			988.5	2.7	5.1	5	19			
46003		24	52.0N	156.0W	01	05	M44			982.1	3.6	5.1	5	22			

\+ Direction for sea waves same as wind direction
X Direction or period of waves indeterminate
M Measured wind

*NOTE: The observations are selected from those with winds ≥ 35 kn or waves ≥ 25 ft from May through August (≥ 41 kn or ≥ 33 ft, September through April). In cases where a ship reported more than one observation a day with such values, the one with the highest windspeed was selected.

U.S. Cooperative Ship Weather Reports

November and December 1980

TOTAL WEATHER REPORTS RECEIVED FROM US COOPERATIVE OBSERVING SHIPS NOVEMBER AND DECEMBER 1980

SHIP NAME	VIA RADIO	VIA MAIL
ACADIA	23	
ADM WM M CALLAGHAN	25	124
AFRICAN STARS	5	6
ALASKAN	62	140
ALLISON LYKES	8	68
AMELIA TOPIC	2	154
AMERICAN ACE	36	110
AMERICAN ARCHER	79	61
AMERICAN CHALLENGER	13	86
AMERICAN EAGLE	7	27
AMERICAN LARK	31	37
AMERICAN LEGION	11	67
AMERICAN RANGER	25	51
AMOCO CONNECTICUT	1	
AMCO STANE	35	
ANNA REHDER	22	
ARCO ALASKA	30	38
ARCO FAIRBANKS	62	102
ARCO SAG RIVER	14	76
ARNOLD MAERSK	4	77
ASIA BRAVERY	5	86
ASIAN ASSURANCE	2	41
ATLANTIC PIONEER	21	76
AUSTRAL LIGHTNING	65	127
AUSTRAL RAINBOW	69	116
B T SAN DIEGO	7	97
BARBER TAIF	20	19
BARTLETT AGOR 13	11	
BELLMAN	50	68
BLUE OCEAN	6	108
BOSTON	24	89
BRILLIANT STAR	8	
BUNGA CHEMPAKA	1	
CAPRICORN	41	82
CHANCELLORSVILLE	8	69
CHARLESTON	15	57
CHASTINE MAERSK	4	23
CHERRY VALLEY	2	44
CHEVRON ARIZONA	45	111
CHEVRON COPENHAGEN	19	
CHEVRON MISSISSIPPI	45	119
CHEVRON PERTH	18	83
CHRISTOPHER LYKES	6	
CLOVER	45	97
COLUMBUS LOUISANA	26	
CONCORDIA STAR	26	
CORINTO MARU	22	24
CRESSIDA	45	121
DAFFODIL	7	104
DANA AMERICA	1	
DAVID P REYNOLDS	55	147
DEL CAMPO	2	32
DEL SOL	4	44
DELAWARE SUN	6	34
DELTA BRASIL	17	
DELTA MAR	8	42
DELTA SUD	8	43
DIANA	28	
DJATISARI	11	
DONA CORAZON II		121
DUBHE	1	
EASTERN DIAMOND	3	272
EASTERN RIVER	4	
EASTERN WORLD	11	13
ENNA G	60	141
ESSO BAYONNE	3	
ESSO PROVIDENCE	4	
EVER SHINE	26	85
EXPORT BANNER	13	44
EXPORT COURIER	8	33
EXXON BALTIMORE	5	18
EXXON FLORENCE	13	25
EXXON LEXINGTON	1	
EXXON SAN FRANCISCO	23	22
FPH MATARENGI	1	
FREDERICK LYKES	20	42
GAMHIRA	1	
GENEVIEVE LYKES	18	44
GIBRALTAR PANSY	5	
GLOBAL FRONTIER	22	69
GOLDEN GATE	4	56
GOLDEN ROD	35	48
GREAT OCEAN	41	129
GREEN HARBOUR	7	22
GUADALUPE I	5	
GULF SHIPPER	3	89
HAIDA BRAVE	1	
HARDANGER	7	10
HILLYER BROWN	4	
HOEGH MASCOT	3	38
HOEGH ORCHID	5	11
HONSHU GLORIA	23	
HOWARD W BELL		54
IMPERIAL	6	7
IRIS ISLAND	26	107
IVAN TOPIC	14	
JACKSONVILLE	18	108
JAPAN ACE	111	51
JAPAN RAINBOW	8	46
JOSEPH LYKES	2	14
KEIYO	14	90
KNORR	55	86
KOREAN FIR	13	5
KUROBE MARU	29	14
LAKE SHASTA	18	42
LASH PACIFICO	25	60
LESLIE LYKES	52	51
LIONS GATE BRIDGE	112	74
LUIGI GRIMALDI	39	
MAMMOTH FIR	4	7
MANUANILI	55	104
MANZANARES	9	
MARCONA CONVEYOR	11	63
MARDI GRAS	10	11
MARIA U	11	1
MARITIME INVESTOR	10	
MARJORIE LYKES	9	96
MAUI	72	140
MAYO LYKES	19	13
MELVILLE	6	104
MERCY	22	
ACE ENTERPRISE	6	
ADRIAN MAERSK	19	142
AGUADILLA	13	30
ALBATROSS IV	40	
ALLTRANS EXPRESS	22	63
AMERICA MARU	94	45
AMERICAN ALLIANCE	34	113
AMERICAN ARGOSY	26	96
AMERICAN CHARGER	17	63
AMERICAN HIGHWAY	11	
AMERICAN LEADER	32	116
AMERICAN LIBERTY	22	68
AMERICAN RELIANCE	15	49
AMOCO DELAWARE	4	
AMCO TEMPLAR	97	
ANNIE JOHNSON	24	62
ARCO ANCHORAGE	47	61
ARCO HERITAGE	13	
ARECIBO	54	89
ARTHUR MAERSK	17	51
ASIA HERO	20	
ASIAN EXPRESS	33	
ATLANTIC RAINBOW	26	171
AUSTRAL MOON	33	119
AVILA	1	
BALD BUTTE	21	63
BARBER TOBA	20	
BATAMON		10
BERGLJOT	28	93
BLUEBIRD	44	
BOUTWELL WHEC 719	47	65
BRINTON LYKES	15	54
BUNGA MELAWIS	10	
CARIBBEAN ENDEAVOUR	1	
CHAPMAN	26	
CHARLOTTE LYKES	10	
CHAUVENET T AGS 29		156
CHESHIRE	1	
CHEVRON BURNABY	6	2
CHEVRON EDIMBURGH	8	20
CHEVRON NORTH AMERICA		87
CHEVRON SOUTH AMERICA		226
CHUEN ON	8	
COLORADO	8	19
COLUMBUS NEW ZEALAND	41	122
CONCORDIA SUN	4	
CORNUCOPIA	38	
CRISTOBAL	38	75
DALAMAN	3	
DANA ARABIA	2	3
DAVID STARR JORDAN	5	34
DEL MONTE	1	1
DEL VIENTO	2	2
DELTA AFRICA	3	49
DELTA CARIBE	12	72
DELTA MEXICO	4	6
DELTA URUGUAY	6	
DILIGENCE WHEC 616	17	
DOCEANGRA	9	15
DONA MAGDALENA		124
DYVI HATTEGAT	10	38
EASTERN FORTUNE	4	19
EASTERN SUN	13	
EDGAR M QUETHY	18	
ERNA ELDENDORFF	1	
ESSO CHITTAGONG	7	
ESSO SAINT JOHN	27	52
EVER SPRING	37	69
EXPORT BUYER	35	78
EXPORT FREEDOM	16	22
EXXON BATON ROUGE	17	23
EXXON HOUSTON	36	58
EXXON NEW ORLEANS	28	51
FAIRWEATHER	31	40
FLEETBANK	17	
FRIENDSHIP	28	80
GARDENIA	37	25
GENISTA	1	
GLACIER WAGB 4	201	
GLOBAL WIND	28	
GOLDEN GATE BRIDGE	85	78
GOLDENSARI II	14	73
GREEN AUKLET	31	
GREEN ISLAND	17	63
GULF BANNER	8	22
GULF TRADER	8	19
HAMILTON WHEC 715		17
HARNAJUDA	1	
HOEGH CLIPPER	21	
HOEGH MERIT	9	
HOEGH ORRIS	7	
HOTORA MARU	58	28
HOWELL LYKES	15	12
INACHUS STAR	19	88
INIS QUEEN	93	
J E GOSLINE	3	
JALAYAMUNA	6	
JAPAN AMBROSE	47	43
JARVIS WHEC 725		72
JUTHLANDIA	9	124
KENAI	10	130
KOFUKU MARU	29	
KOREAN LEADER	9	31
LAKE ARROWHEAD	13	26
LAKE TAHOE	11	28
LAUREL WL02801	7	
LETITIA LYKES	8	
LONGAVI	1	
LUTZ SCHROEDER	14	
MANHATTAN	25	61
MANUKAI	71	105
MAR CARIBE	1	
MARCONA EXPORTER	7	205
MARGARET JOHNSON	29	74
MARINE CHEMICAL TRANSP	92	131
MARITIME JUSTICE	8	
MASON LYKES	32	64
MAUMEE	6	20
MC ARTHUR	5	
MENESTHEUS	29	42
MEXICO	9	
MONCAGUA	5	9
MORTAJN	45	
NIMEE LYKES	5	38
ALBERT MAERSK	13	21
ALMERIA LYKES	43	78
AMERICA SUN	44	132
AMERICAN APOLLO	2	2
AMERICAN ARROW	1	
AMERICAN CHIEFTAIN	29	119
AMERICAN INDEPENDENCE		4
AMERICAN LEGACY	58	115
AMERICAN LYNX	46	122
AMERICAN TRADER	39	200
AMOCO MILFORD HAVEN	18	44
ANDERS MAERSK	20	44
ANTONIA JOHNSON	9	98
ARCO CALIFORNIA	51	104
ARCO JUNEAU	53	27
ARGONAUT	23	76
ASHLEY LYKES	17	72
ASIA INDUSTRY		28
ASIAN HIGHWAY	25	22
AUSTRAL ENTENTE		51
AUSTRAL PIONEER	13	59
AXEL MAERSK	9	30
BALTIMORE TRADER	14	76
BARBER TONSBERG	10	
BATANG	51	
BLESS RIVER	11	72
BOGASARI DUA	4	
BRAZOS	62	126
BROOKS RANGE	12	24
C V LIGHTNING	10	24
CARNIVALE	10	36
CHARLES LYKES	43	128
CHARLOTTE MAERSK	5	23
CHAVEZ	6	
CHESNUT HILL	24	168
CHEVRON CALIFORNIA	62	113
CHEVRON KENTUCKY	74	
CHEVRON OREGON	16	45
CHEVRON WASHINGTON	46	110
CIUDAD DE MERIVA		36
COLUMBIA	8	39
COMET		37
CONTRACT TRADER	1	
CORNELIA	1	
CRYSTAL SEED	7	
DAMODAR SEN T.J. PARK	1	
DART EUROPE	69	96
DAVIDSON	1	2
DEL ORO	6	35
DELAWARE GETTY	29	145
DELTA AMERICA	1	36
DELTA COLUMBIA	3	9
DELTA PANAMA	5	
DELTA VENEZUELA	10	27
DISCOVERER OSS	59	67
DOCTOR LYKES	39	159
DORIC	14	51
DYVI PACIFIC	12	17
EASTERN MUSE	83	
EASTERN TREASURE	68	98
ELISABETH MAERSK	2	
FORADALE	1	
ESSO NASSAU	1	
EURO-ASIA CONCORDE	3	26
EVER VALUE	6	23
EXPORT CHALLENGER	14	26
EXPORT LEADER	5	50
EXXON BOSTON	10	24
EXXON HUNTINGTON	26	48
EXXON NORTH SLOPE	18	26
FALSTRIA	18	109
FORT HOSKINS	8	
GABE LUNO	33	
GARTHNEYDD	16	31
GEORGE M KELEZ	5	
GLACIER BAY	4	157
GLOBAL CHALLENGER	76	168
GOLDEN PRINCE		55
GRAND GLOBE	18	6
GREEN FOREVER	86	91
GREEN KOBE	15	
GULF FARMER	1	8
H J MAYNES		45
HANJIN INCHEON	10	18
HELLESPONT GLORY	6	41
HOEGH ELITE	1	
HOEGH MINERVA		42
HOEGH PRIDE	3	16
HOUSTON	5	
HUDSON T-AO 188	8	
INGER	13	49
ITALICA	17	
J LOUIS	25	64
JAMAICA MARU	77	56
JAPAN APOLLO	37	66
JEAN LYKES	2	
KASHU MARU	78	49
KENNETH E HILL	8	57
KOPAA	59	76
KOREAN PRIDE	19	14
LAKE BERRYESSA	7	
LASH ATLANTICO	14	69
LAVAUX	12	42
LENA MAERSK	46	
LOUISE	44	131
MAGDALENA	39	
MAJESTIC	9	31
MANULANI	62	145
MAR DE CORTEZ	1	
MARCONA TRADER	24	65
MARGARET LYKES	9	
MARITIME BRILLIANCE	5	
MARITIME PIONEER	1	
MATHIESON		69
MAYA PIONEER		52
MEADOWBROOK	3	68
MERINA ALICE	33	
MIDAS SEINE	24	22
ADABELLE LYKES	6	135
AFRICAN DAWN	23	34
ALASKA STANDARD	22	32
ALEUTIAN DEVELOPER	19	29
ALVA MAERSK	15	46
AMERICAN ACCORD	38	97
AMERICAN AQUARIUS	10	61
AMERICAN ASTRONAUT	90	138
AMERICAN CORSAIR	12	38
AMERICAN LANCER	12	78
AMERICAN LEGEND	32	104
AMERICAN RACER	11	1
AMERICANA	12	27
AMUR CAREER	34	72
ANNA MAERSK	8	48
AQUARIUS	13	32
ARCO ENTERPRISE	1	
ARCO PRESTIGE	18	48
ARILD MAERSK	11	77
ASIA BEAUTY	9	
ASIA MORALITY	1	
ATHEL LAADKI	4	
AUSTRAL ENVOY	14	81
AUSTRAL PURITAN	7	25
B T ALASKA	4	104
BARBER PRIAM	28	15
BARRANCA	46	
BEISHU MARU	94	21
BLUE BOTTLE	21	44
BORINQUEN	47	111
BRIGIT MAERSK	3	
BUILDER	3	61
CALIFORNIA RAINBOW	37	43
CELESTINO	3	
CHARLES PIGOTT		145
CHASE WHEC 718	99	
CHEMICAL VENTURE	40	
CHEVRON ANTWERP	23	111
CHEVRON COLORADO	19	84
CHEVRON LOUISIANA	1	
CHEVRON PERNIS	35	118
CHIBA	24	49
CLARA MAERSK	3	
COLUMBUS AMERICA	22	104
COMMON VENTURE	48	
CORAL ACE	2	
COURAGEOUS WHEC 622	5	
CRYSTAL STAR	40	39
DANA AFRICA		9
DAVID D. IRWIN	18	28
DEFIANCE	17	52
DEL RIO		31
DELAWARE II	48	63
DELTA ARGENTINA	16	40
DELTA ECUADOR	18	37
DELTA PARAGUAY	10	
DIAMOND PHOENIX	38	141
DITTE SKOU	13	74
DOLLY TURMAN	14	
DUANE	8	
E. HORNSBY WASSON	70	173
EASTERN PACIFIC	9	24
EASTERN WISEMAN	9	
ELIZABETH LYKES	16	
ESSO BANGKOK	8	
ESSO PHILIPPINES	17	53
EVELYN MAERSK	1	
EVERGREEN WAGO-295	1	
EXPORT CHAMPION	3	
EXPORT PATRIOT	38	86
EXXON CHESTER	7	
EXXON JAMESTOWN	7	16
EXXON PHILADELPHIA	38	117
FESTIVALE	1	
FRANCIS SINCERE NO 6	31	
GALLEON ONYX	13	
GEMINI	6	
GEORGE M KELLER	18	122
GLADIOLUS	13	
GOLDEN DAISY	14	11
GOLDEN RAY	6	
GREAT LAND	62	92
GREEN FORARD	12	
GREEN VALLEY	16	76
GULF MERCHANT	18	31
HADJI AGUS SALIM	9	22
HANJIN POHANG		18
HEIEI MARU	134	74
HOEGH MALLARD	8	84
HOEGH MIRANDA	8	
HONSHU BREEZE	22	66
HOWARD O VESPER	8	20
HUMACAO		112
INGHAM WHEC 35		2
ITAPUCA	7	
J R GREY		33
JAMES LYKES	17	63
JAPAN CADDO	13	82
JOHN LYKES	1	18
KAUAI	75	141
KEYSTONER	61	94
KOREAN COMMANDER	4	14
KRPAN	1	
LAKE PALOURDE	28	129
LASH ITALIA	18	28
LEO	17	14
LILLOGET	34	
LOUISE LYKES	2	
MALLORY LYKES	11	102
MANISTEE	30	73
MANULEI	93	93
MARCHEN MAERSK	2	10
MARCONA TRANSPORTER	19	103
MARIA TOPIC	18	46
MARITIME HARMONY	6	
MARITIME QUEEN	3	13
MATSONIA	94	115
MAYAGUEZ	24	42
MELLON WHEC 717		84
MERRIA	46	107
MILENA	24	

TOTAL WEATHER REPORTS RECEIVED FROM US COOPERATIVE OBSERVING SHIPS NOVEMBER AND DECEMBER 1980

SHIP NAME	VIA RADIO	VIA MAIL
MILLER FREEMAN	43	61
MING STAR	3	
MOBIL LUBE	23	88
MOBILFUEL	28	55
MORANT	56	
MORMACORACO	21	52
MORMACRIGEL	13	40
MORMACSTAR	33	105
MORMACWAVE	12	
MUNRO WMEC 724	21	26
NEGO ENTERPRISE	1	
NEPTUNE JADE	31	33
NEWARK	73	117
NORDIC LOUISIANA	47	
NORWAY	63	
OCEAN LOG	46	54
OGDEN CONGO	5	40
OJI GLORIA	31	12
ORANGE	16	
ORIENTAL CHAMPION	46	43
ORIENTAL EXPORTER	41	84
ORIENTAL QUEEN	10	
OVERSEAS ALEUTIAN	6	
OVERSEAS JOYCE	23	60
PACHARON	19	31
PACEMPEROR	15	
PACIFIC ERA	44	78
PACIFIC SAGA	30	90
PACMAJESTY	2	
PACPRINCE	31	29
PAN KOREA	5	
PENNMAR	7	
PHILADELPHIA	54	77
PIONEER COMMANDER		35
PIONEER NO 1	21	17
PORT CARTIER	1	
PRESIDENT FILLMORE	31	104
PRESIDENT HOOVER	84	148
PRESIDENT KENNEDY	34	121
PRESIDENT POLK	38	77
PRESIDENT TYLER	64	132
PRINCE WILLIAM SOUND	29	125
QUEENS WAY BRIDGE	48	39
RALPH B JOHNSON	18	41
RESEARCHER	21	38
RICHARD	45	117
ROBERT E LEE	10	
ROSE CITY	40	140
S P LEE	18	125
SAM RATULANGIE	14	
SAN MARCOS	27	59
SANSINENA II	25	111
SANTA CRUZ	6	20
SANTA LUCIA	2	20
SANTA MERCEDES	29	112
SCANDINAVIAN HIGHWAY	30	12
SEALAND CONSUMER	24	93
SEALAND ENDURANCE	26	64
SEALAND FREEDOM	12	31
SEALAND LEADER	20	103
SEALAND PIONEER	12	
SEALAND VENTURE	8	78
SEATRAIN INDEPENDENCE	53	109
SEATRAIN YORKTOWN	51	191
SEPTA	28	
SHING ON	8	
SILVER PHOENIX	25	43
SIMRA	30	124
SNAURAN	63	121
SNOW STORM	7	32
SOLON TURMAN	14	25
SPRAY DERRICK	20	
STAR HONGKONG	28	
STOLT LLANDAFF	16	133
STUYVESANT	1	
SVENDORG MAERSK	7	
TAIKO VENTURE	17	
TAMPA	13	17
TAURUS	42	100
TEXACO MARYLAND	4	
TEXAS TRADER	4	21
THOMAS MAERSK	1	
THOMPSON PASS	19	39
TOLUCA	12	80
TOWNSEND CROMWELL	121	148
TOYOTA MARU NO 17	1	2
TRAVIATA	7	15
TUBUL	11	
ULTRASEA	7	
UNIVERSE	13	
VAN FORT	21	80
VANGUARD		44
VIOLET	30	
WASHINGTON TRADER	19	71
WESTERN SUN	18	74
WILLIAM E MUSSMAN	36	169
WORLD CANDOUR	28	
YOCONA WMEC 168	6	11
ZIM HONGKONG	9	21
ATGY	11	46
BLHW	12	21
DMCD	7	14
DSQC	49	150
DSXA	3	46
ELADR	27	339
ELQG	1	10
GVQE	48	86
HJSY		101
JCUF	62	97
JAVE	3	
JREB	17	86
KGJF	23	95
KJUS		26
KSFJ	17	116
MACV		1
NNBN		436
SGLN	44	128
WDZB	28	107
WNJB		15
WZLR190		41
ZCKV	30	70
5LMX		5
5MSW	12	13
6ZRT	40	144
9VKU	3	94

SHIP NAME	VIA RADIO	VIA MAIL
MING GALAXY	15	27
MOBIL AERO	2	97
MOBIL POWER	28	122
MOBILGAS	5	57
MORMACALTAIR	22	68
MORMACGLEN	8	23
MORMACSAGA	4	
MORMACSUN	48	103
MORNING GLORY	12	40
NAGARA	22	97
NEPTUNE AMBER	62	101
NEPTUNE LEO	1	
NODAWAY	44	57
NORSE PILOT	54	53
NURA DEL MAR	14	10
OCEANIC	90	177
OGDEN FRASER	31	43
OLEANDER	106	127
ORCO MINER	2	
ORIENTAL COMMANDER	25	42
ORIENTAL JADE	1	
ORIENTAL SOVEREIGN	25	39
OVERSEAS ALICE	1	
OVERSEAS JUNEAU	19	61
PACARGENTINA	11	21
PACGLORY	8	
PACIFIC GLORY	38	
PACIFIC TRADER	59	
PACMERCHANT	19	31
PACPRINCESS	32	
PAN WESTERN	15	
PEREIRA D'ECA	1	
PHILIPPINE ANTONIO LUN		20
PIONEER CONTENDER	14	72
POLAR ALASKA		119
PORTLAND	68	98
PRESIDENT GARCIA	25	75
PRESIDENT JACKSON	11	
PRESIDENT MADISON	51	147
PRESIDENT TAFT	29	61
PRESIDENT VAN BUREN	47	102
PROSPERITY	26	
QUINTINA	45	
RED JACKET	9	44
RESOLUTE	10	32
RIGOLETTO	8	
ROBERT WATT MILLER	1	
ROYAL VIKING SKY	32	66
SACRAMENTO	1	39
SAMOA	34	
SANDGRAIN	1	2
SANTA ADELA	3	
SANTA ELENA		3
SANTA MAGDALENA	14	88
SARGODHA	20	103
SCILLA	32	74
SEALAND DEFENDER	17	47
SEALAND EXCHANGE	93	114
SEALAND GALLOWAY	37	128
SEALAND MARKET	25	52
SEALAND PRODUCER	6	80
SEALAST MEDITERRANEAN	1	
SEATRAIN LEXINGTON	34	49
SEAWAY	31	
SEVEN OCEAN	12	
SHIPLEY LYKES	24	16
SILVER STAR	14	
SINALOA	47	113
SKOUBORO	15	47
SNOWDRIFT	43	57
SOUTHWARD	9	57
STADT BREMEN	28	
STARWARD	16	18
STONEWALL JACKSON	2	36
SUGAR ISLANDER	19	37
SWEETBRIER WLB 405	29	
TAMARA	11	
TANEY WMEC 37	3	
TENNESSEE	5	18
TEXACO MASSACHUSETTS	1	16
TFL DEMOCRACY	12	
THOMAS NELSON	20	39
TILLIE LYKES	21	14
TONIC TOPIC	1	19
TOYOTA MARU 10	57	32
TOYOTA NO 24		15
TRIUMPH	29	51
TUNISIAN REEFER	29	
UNION PROGRESS	2	37
UNIVERSE KUPE	29	146
VAN HAWK	13	53
VELMA LYKES	30	
VIRGINIA STAR	8	
WASHINGTON WOOD	6	98
WESTWARD VENTURE	87	99
WILMINGTON BETTY	28	63
WORLD HERCULES	1	
YOUNG SEAGULL	11	51
ZIM MONTREAL	39	90
ATPE	40	118
BMDK	19	30
DVKL		106
DSSF	9	16
DSZU	21	52
ELAMB	2	33
ELDU	27	22
HPCF	23	61
HSAC	8	16
JEUS	8	10
JLJL	75	42
KAD285	16	45
KGJX	8	34
KNOL		30
KSFK	16	66
NDCV		1
NUBP		16
SGPY	9	21
WGJF	67	107
WQZ220		11
WZY9373		47
ZCUT	35	93
5LUR	39	192
5MUE	34	178
8AKF	123	103

SHIP NAME	VIA RADIO	VIA MAIL
MING GLORY	12	
MOBIL ARCTIC	37	104
MOBIL VENTURE	1	
MONMOUTH	3	12
MORMACARGO	14	25
MORMOLYNX	7	31
MORMACSEA	6	48
MORMACTIDE		22
MOUNT VERNON VICTORY	19	
NANCY LYKES	15	
NEPTUNE CRYSTAL	44	62
NEW GOLDEN PHOENIX	50	38
NOPAL SEL	12	
NORTHERN LIGHT	57	112
OCEAN CROWN	15	
OCEANOGRAPHER	242	
OGDEN THAMES	3	81
OLGA MAERSK	2	23
ORE JUPITER	6	
ORIENTAL ESEARCHER	25	
ORIENTAL LEADER	17	83
ORIENTAL STATESMAN	22	72
OVERSEAS ARCTIC	8	52
OVERSEAS NEW YORK	3	
PACDUCHESS	18	
PACIFIC ACE	8	
PACIFIC HIGHWAY	53	38
PACIFIC VENTURE	76	184
PACMONARCH	15	
PACSTAR	23	6
PARALLA	15	38
PENSIVAL ACE	89	264
PHILLIPS NEW JERSEY	1	
PIONEER CONTRACTOR		1
POLAR STAR WAGB-10	77	
PRESIDENT ADAMS	11	38
PRESIDENT GRANT	35	94
PRESIDENT JEFFERSON	43	107
PRESIDENT MC KINLEY	42	137
PRESIDENT TAYLOR	21	43
PRESIDENT WILSON	17	70
PUNTA MALVINAS	2	
QUIRAPA	25	43
REGINA CELI	3	
RESOLUTE WPC 620	2	
RIO COBRE	1	
RODRIGES CABRILHO	40	
ROYAL VIKING STAR	11	
SALVADOR	43	43
SAMUEL S	22	9
SANDSTAR	18	
SANTA BARBARA	9	13
SANTA FE	8	27
SANTA MARIA	4	
SATSUMA	8	18
SEA LAND VOYAGER	2	28
SEALAND DEVELOPER	24	42
SEALAND EXPRESS	14	
SEALAND INDEPENDENCE	13	78
SEALAND MCLEAN	47	113
SEALAND RESOURCE	60	132
SEASPEED ASIA	14	25
SEATRAIN ORISKANY	43	123
SEDGE WLB 402	74	
SHANGRI LA	32	
SHUNKIND	79	169
SILVERLIME		61
SINCERE NO 3	17	
SKYWARD	4	15
SOCONY VACUUM	1	5
SOUTHWEST CAPE	37	
STAR DIEPPE	38	
STEADFAST WMEC 623		28
STOPIS WAGB 38	3	
SUN VIKING	1	
T F L INDEPENDENCE	2	
TALISMAN	12	
TARA	3	
TERRIER	10	
TEXAS	14	25
TFL FREEDOM	1	
THOMAS WASHINGTON	23	
TOMBEI MARU	21	1
TONSINA	39	143
TOYOTA MARU 12	107	181
TRANSCOLORADO	10	56
TROPICANA	14	
TYSON LYKES	39	92
UNIQUE FORTUNE	8	
VALLEY FORGE	31	93
VAN TRIUMPH	23	117
VICENTE GUERRERO	6	
WALCHAND	1	
WESER EXPRESS	6	104
WESTWIND WAGB 281	10	
WINTER HAVE	14	45
WORLD MEDAL	2	
YUKON T-AO 152	28	59
ZOELLA LYKES	20	120
ATGL	4	51
CRDB		1
DSEF	9	11
DSVW	8	123
DTBY	1	37
ELCJ	27	48
FLYM	62	154
HPEY	23	64
HSRD	3	65
JWAC	19	28
JWVI	77	74
KGJR	12	39
KHRF	15	32
KPWZ		44
KSLB	46	110
NDCV	11	29
NVBK		41
VRCN		33
WBJW	18	39
WYS3261		72
YCSA		1
3FMS	1	7
5MHJ	22	81
5MYH	35	113
9VMG	28	49

SHIP NAME	VIA RADIO	VIA MAIL
MING MOON	17	
MOBIL COMET	1	
MOBILE MERIDIAN	47	83
MONTICELLO VICTORY	1	
MORMACDAWN	16	58
MORMACMOON	8	101
MORMACSKY		10
MORMACVEGA	11	52
MOZART FESTIVAL	12	
NECHES	2	2
NEPTUNE DIAMOND	54	121
NEW JERSEY MARU	63	76
NOPAL VERDE	9	23
NORTHERN VICTORY	21	95
OCEAN GOLF	7	39
OCTA	37	104
OGDEN WILLAMETTE	11	24
OLGA TOPIC	7	46
ORE MERIDIAN	17	144
ORIENTAL EXECUTIVE	8	
ORIENTAL MERCHANT	74	139
OTTO N. MILLER	21	95
OVERSEAS CHICAGO	4	6
OVERSEAS VALDEZ		47
PACDUKE	22	79
PACIFIC ARROW	116	76
PACIFIC PEACE	8	79
PACLADY	13	28
PACNOBLE	9	2
PAN ASIA	4	44
PASSUMPSIC AO-107		88
PERRYVILLE	2	1
PINK SKY	3	9
PIONEER MOON	23	79
POLYNESIA	17	73
PRESIDENT CLEVELAND	36	105
PRESIDENT HARRISON	10	41
PRESIDENT JOHNSON	60	157
PRESIDENT PIERCE	45	136
PRESIDENT TRUMAN	45	
PRINCE OF TOKYO	34	77
PURE OIL	17	88
RAINIER	27	33
RELIANCE WMEC 615		1
REVERE	36	61
RIO TUXPAN	1	
ROSE		91
RUTH LYKES	23	
SAM HOUSTON	13	
SAN FRANCISCO	9	74
SANKOSUN	10	
SANTA CLARA	8	63
SANTA ISABEL	1	9
SANTA MARIANA	31	63
SATURN	1	
SEALAND COMMERCE	42	107
SEALAND ECONOMY	41	97
SEALAND FINANCE	11	39
SEALAND INNOVATOR	18	
SEALAND PATRIOT	14	32
SEALAND TRADE	32	76
SEATIGER	1	
SEATRAIN TRENTON	49	63
SEKI POKAKO	4	5
SHERMAN WMEC 720	87	140
SIENA	28	47
SILVERPLANA	38	83
SINCERE NO 5	27	
SNOW CRYSTAL	7	15
SONJO INTREPID	7	31
SPERO	16	
STAR DOVER	22	83
STELLA LYKES	25	
STREAM MAUSER	23	28
SUSQUEHANNA	4	
T F L LIBERTY		48
TALUGA T-AO-62		86
TASSO	16	
TEXACO FLORIDA	4	
TEXAS SUN	1	10
THOMAS G THOMPSON	1	129
THOMPSON LYKES	5	
TOKYO RAINBOW	1	
TOSCA	3	
TOYOTA MARU 43	38	21
TRANSCOLUMBIA	24	125
TSU	6	
ULTRAMAR	3	
UNITED SPIRIT	8	70
VAN CONQUEROR	46	104
VAN WARRIOR	6	11
VIENNA WOODS	14	17
WALTER RICE	29	130
WESTERN HIGHWAY	71	108
WHITING	3	
WISTERIA	14	18
YAMASHIN MARU	116	137
ZAPATA COURIER	1	
2YK5		1
ABWA	68	107
CGCE		4
DSN2	25	80
DSWE	9	97
DXCA		52
ELIJ	3	10
ESLP		14
HJLI		6
HQAS		10
JWLK	9	16
JWZP	62	76
KDJD	15	58
KHRP	35	112
KPXL	27	46
LIUM	19	22
NHMX		24
PPJT	5	4
WDBU	9	36
WHTB		33
WZRE		20
YCSB	19	36
3FYC	9	14
5MOS	12	11
6ZDD	28	40
9VDE		1

SUMMARY: GRAND TOTAL VIA RADIO 2C618 GRAND TOTAL VIA MAIL 44628

Rough Log, North Atlantic Weather

February and March 1981

ROUGH LOG, FEBRUARY 1981--There was no primary storm path this month. Most storms had an overall northeasterly orientation, but they were spread out from the central United States to Europe. There were several cyclones over the Mediterranean, and these had an easterly orientation. Climatology indicates two primary tracks: one from the Great Lakes to Nova Scotia then northward, where it split south of Kap Farvel; the other from the Carolina coast northeastward toward Iceland and again splitting, one branch west of the Island and the other south.

The monthly mean sea-level pressure pattern was vastly different from climatology. The Icelandic Low was 996 mb near Keflavik, about 500 mi northeast of its normal 997-mb position. The Azores High dominated the ocean south of 50°N, extending much deeper into Europe and the United States than normal. There were two 1025-mb centers--one off Cape Race and the other at the normal location over the Azores.

The displacement of centers produced two major anomaly centers. The negative one was 10 mb near Keflavik. A positive 15-mb center was east of Cape Race and was the much larger of the two. The zero departure isoline roughly paralleled latitude 20°N on the south and on the north followed a curve from Lake Huron to Cape Chidley to Kap Farvel to Rockall Bank to Nordkapp.

In the upper air at 700 mb the low center was 240 m lower than normal over Devon Island. The longwave trough was retrograded from the U.S. East Coast to west of the Appalachian Mountains. There was an anomalous trough west of Europe with the usual ridge pushed eastward over the continent.

Figure 44.--This infrared image shows this very deep storm even though it is above the Arctic Circle.

Extratropical Cyclones--On the fifth day of the month a large 1040-mb HIGH was centered near 42°N, 25°W. A LOW was traveling northward over the Labrador Sea and, as happens many times, another LOW popped up over the Denmark Strait area. Ocean Weather Station Charlie had 40-kn winds with 20-ft seas east of the front. By 1200 on the 6th the LOW was 944-mb near 70°N, 01°W (fig. 44). The pressure had plunged 27 mb in 24 hr. The C.P. DISCOVERER was west of the Outer Hebrides with 58-kn west winds, 23-ft seas, and 33-ft swells. The MULAFOSS was south of Iceland with 60-kn winds. By 0000 on the 7th the storm had dropped 4 more mb to 940 mb, a very deep storm. Gales of 40 kn were blowing at the Island stations and North Sea ships and platforms were measuring winds over 50 kn with waves up to 30 ft.

A frontal wave imbedded in the zonal flow raced across the Faeroe Islands late on the 7th. OWS Lima had 48-kn winds and 28-ft seas. There were six observations of winds greater than 60 kn and four observations of waves of 39 ft in the area of 60°N, 01°E. Two within 65 mi of each other had 75-kn winds at 0600 on the 8th. The jack-up drilling platform DIRK broke loose in the northern Kattegat. Tugs finally got the rig under control only 2 mi from the coast. Another drilling platform, the new hull no. 11, got in trouble 20 mi west of Kvitsoy. The tow was cut, but later re-established when the sea moderated 13 mi from Kvitsoy. On the 9th the original LOW was weakening over Nordkapp and the frontal wave was deep into the U.S.S.R.

A frontal wave from the Gulf of Mexico crossed Jacksonville, Fla., late on the 7th. It moved up the U.S. East Coast and late on the 8th absorbed the circulation of a LOW moving eastward north of the Great Lakes. Several ships including the IMPERIAL ST. CLAIR had winds between 45 and 50 kn on the 9th. SEDCO had 49 kn on the 10th.

On the 11th the storm center slammed into Ivigtut on the southwest coast of Greenland, and a LOW broke off on the southwest coast. The CRYOS (51°N, 51°W) reported 60-kn winds. The circulation now spread as far east as Ireland. The AMERICAN ALLIANCE (48°N, 32°W) had 50 kn with 28-ft swells. The OSLO VENTURE (46°N, 38°W) had 38-ft swell waves. By 1800 CHARLIE was measuring 48-kn winds with 33-ft seas that increased to 39 ft at 2100. The PIONEER CONTENDER also had 33-ft waves. The NECHES had 30-ft waves with 50-kn winds near 43°N, 23°W, on the 12th. There was a large 1056-mb HIGH slightly south-

east of Cape Race at 1200 on the 11th. Late on the 12th the LOW and HIGH both weakened.

This storm raced out of the southwestern United States. It moved across Lake Huron on the 11th, already a powerful storm, but only its outer reaches were off the east coast. It crossed Ungava Bay on the 12th. High pressure was following the storm on a northeastward track. At 1200 on the 13th the 960-mb low center was near 70°N, 58°W. The 1053-mb HIGH was centered near Portland, Maine. This was a 93-mb pressure spread over about 1,700 mi. This was an average pressure gradient of about 5.5 mb per 100 mi. There were no ship reports of high winds over the Labrador Sea, but it was probably because there were few or none present. Several northeastern U.S. cities reported all-time record pressure readings. Those that were included in the above 31.00 in of mercury club were Washington, D.C. (31.02); Hartford, Conn. (31.03); Allentown, Pa. (31.03); and Philadelphia, Pa. (31.05). The HIGH moved offshore and weakened as the storm weakened over Baffin Bay.

As the high pressure above moved offshore, a frontal wave formed south of the HIGH on the old front originally associated with the deep LOW. At 1200 on the 15th the GEORGE OUSHAKOV was analyzed as being within 2 mb of the 1005-mb storm center near 44°N, 44°W, with 45-kn winds and 18-ft seas. Early on the 16th the BRITISH MAPLE near 63°N, 20°W, had 45-kn winds with 33-ft swells, while the TUNGUFOSS at 60°N, 07°W, called the winds 58 kn.

By 1800 on the 16th two Icelandic ships reported winds above 59 kn. By 0000 on the 17th there were five reports above 58 kn. None were reporting wave heights. The highest wind of 68 kn was reported by the ARNI FRIDRIKSSON, HOFSJOKULL, and the TFXK, all in the vicinity of 64°N, 22°W.

A newspaper item from Reykjavik reported winds over 100 kn hit the Island on the 16th and 17th. The fishing vessel HEIMAEY caught a net in her propeller. She broke loose while being towed and drifted ashore on on the south coast. Two men were swept overboard. At this time the 956-mb LOW was over northwestern Iceland (fig. 45). By the 18th the storm was north of latitude 80°N.

A LOW formed off Cape Cod late on the 25th. The center moved southeastward, and a U.S. ship near 30°N, 59°W, reported 50-kn winds and the GYPSUM EMPRESS (43°N, 70°W) had 25-ft swells out of the northwest. At 1200 the OLEANDER had 50-kn winds with 20-ft waves about 160 mi southwest of the center. On the 27th the FRAUENFELS (33°N, 59°W), 300 mi south of the 978-mb center and sailing northward, had 52-kn winds with 33-ft westerly swell waves. Other ships were reporting gales and waves up to 28 ft.

The storm was now on a northeasterly track. The AMERICAN LEGEND (36°N, 62°W) found 48-kn winds at 1200 on the 28th. On March 1 other low centers moved into the circulation and on the 2d this storm was gone.

A LOW crossed the Davis Strait and moved onto the Ice Cap where it vanished. On the next chart on the 22d, a new LOW was found over the Denmark Strait. It remained stationary west of Iceland for the next

Figure 45.--The storm has moved to Scoresby Sound by 1000 on the 17th. The cumulus-type clouds indicate there is still rough weather to the south.

84 hr with a few gales reported now and then. It appeared that on the 26th some colder air was advected south of the upper air LOW and it started moving southeastward. There was a large stationary 1052-mb HIGH east of Leningrad and the eastern gradient tightened.

The CAUCASUS MARU (57°N, 15°W) had 50-kn southerly winds and 30-ft seas at 1200, and the ADRIATIK had 60-kn southeasterly winds and 23-ft seas near 51°N, 13°W, at 1800 on the 26th. There were winds above 50 kn around the British Isles on the 27th.

At 0000 on the 28th the 976-mb LOW was near 53°N, 19°W, (fig. 46). The CAUCASUS MARU was now west of the center with 45-kn winds, 30-ft seas, and 33-ft swells. The LOW was about to absorb another that had moved into the area from the southwest. An observer on the North Sea reported 58 kn and 33-ft waves. At 1200 a platform near 58°N, 0.1°E, reported the winds as 130° at 70 kn with 39-ft seas. There were several reports of waves up to 25 ft. The high winds and waves reported on the northern North Sea continued into March 1. The OSTROV BERINGA was 500 mi southwest of the center of the storm with 64-kn winds. As the storm moved across Ireland and Wales it lost its punch.

The 28,000-ton icebreaking bulkcarrier M.V. ARC-

Figure 46.--At 0930 the storm has moved northward and there is no indication of the LOW that was approaching from the southwest.

TIC began a test voyage across Lake Melville in Labrador. The test was not only to measure the performance of the ship under severe ice conditions but to determine if commercial shipping on the lake is feasible year-round. A similar voyage was made by the Coast Guard icebreaker FRANKLIN last year.

Casualties--The following vessels had problems with ice this month: AFRICAN VIOLET, CAST BEAVER, GOLDEN ENDEAVOR, and ZENKO MARU. The Swedish SEFIR was in distress at Olands Sodra Grund on the 20th due to weather and icing. The crew was rescued, but the vessel apparently sank. The first day of the month began with a collision in fog in the English Channel between the ACTIUM and the HANNAH SPEARING. The Greek tanker AIKATERINI had a fire in the engineroom area on the 1st while 8 mi off Cape Henry, Va. The 36 crewmembers were evacuated. Fire-fighting efforts were hampered by 60-kn winds and high seas. The AMERICA, U.S. destroyer RADFORD, and Coast Guard cutter UNIMAK were on the scene. On the 10th the SOUNION and FEDDY collided in fog off Algiers. This was because of poor visibility but not from fog but a sandstorm. The OCEAN ENVOYdamaged her rudder while avoiding contacting the vessel ahead in the sandstorm in the Suez Canal.

High winds caused these casualties. The CONTRACT TRADER and MARRA collided, the ERODONA was pushed aground, and the MARIAJOSE T. broke her moorings.

These vessels specified heavy weather as the culprit. The JARAMAC 33 sank off Dubai. The VERONA ran aground near Cap Bon, and the OGDEN NELSON had damage to the port anchor on the 5th. The Argentine LA PAMPA arrived Bilboa with damage to the deck and lifeboats plus one container loaded with whiskey washed overboard. The condition of the crew was not stated. The EASTERN ENERGY was anchored off Sardenia until weather abated on the 6th. The Greek TENIA II sank in heavy seas off the island of Skyros on the 8th and it was feared the five crewmembers had drowned. The Liberian OPAL became disabled in the Bay of Fundy. While being towed on the 12th the towline parted and she drifted aground.

The Greek TOXOTIS sustained rudder damage on the 12th enroute to Rotterdam. The towboat GALVESTON sank off the Texas coast in bad weather. Only the master was rescued. The 5,564-ton EASTERN MARINER sank off Bermuda on the 18th after sustaining hull damage in heavy weather on the 14th. The LAGO LANALHUE sustained weather damage while on a voyage from Peru to Italy, January 30 to February 17. The Canadian tanker WITSUPPLY sank off Cabo de la Vela on the 17th enroute to Cartagena. The bulkcarrier OLIVIA encountered heavy weather on the 19th on a voyage from South American ports to New York.

The FAST ONE, FIDIAS, and JAMIL had weather damage on the 22d and 23d in the Mediterranean. The CHITRAL encountered heavy weather on the 22d south of the Azores. The American-registered CALIFORNIA had damage on the 25th on a voyage from Lisbon to Tampa.

ROUGH LOG, MARCH 1981--There were vast differences from climatology in this month's weather pattern. The storms normally track along the St. Lawrence to Kap Farvel, where they split toward the Davis Strait and Iceland. A second track from Cape Hatteras heads northeastward toward Iceland. The major activity this month formed off the New England coast, moved eastward to midocean, then turned northeastward to northward. Several of these storms plus some from the vicinity of Iceland crossed northern Europe. There was a sparsity of storms affecting the Mediterranean.

The Icelandic Low at 993 mb was 12-mb lower than climatology and near 48°N, 36°W, over 600 mi southsoutheast of its normal location. The Azores High at 1021 mb was near 28°N, 22°W, about 12° longitude east of its normal position.

The difference in central pressure and location of the Icelandic Low resulted in a large negative anomaly covering most of the ocean, except off the east coast of Greenland and off the North African coast into southern Spain. The main anomaly centers were minus

16 mb near 45°N, 35°W, and minus 13 mb over Scotland. High pressure dominated the Arctic Ocean with a plus 10-mb anomaly.

In the upper air the primary circulation was near normally located over Devon Island, but there was another low center far south off Cape Race. This displaced the long-wave trough considerably to the east, resulting in northwesterly flow over the East Coast and the easterly path of storms off the coast. The normal slight ridging over western Europe was hardly discernible. As at the surface the majority of the ocean was influenced by below-average heights and negative anomalies.

Extratropical Cyclones--The first severe storm of the month moved out of Manitoba, Canada, on a southeasterly track. It was not an especially severe storm except for cold temperatures and snow in the northerly flow. As the LOW moved across Maine and off the coast on the 3d, a frontal wave was traveling eastward from the Carolinas. As the cold air moved over the warmer waters, the EXPORT BUYER and another U.S. ship had 40-kn northwesterly winds in the vicinity of the Gulf Stream; another reported 20-ft waves.

The storm intensified rapidly, dropping 34 mb in 24 hr to a pressure of 962 mb at 1200 on the 4th. The ATLANTIC CHAMPAGNE (41°N, 60°W) and the S.A. HUGUENOT (33°N, 62°W) both had winds of at least 60 kn. Several ships in the area had waves up to 25 ft. At 0000 on the 5th, a time of minimum radio reports, there were nine reports of 45 kn or greater. The NOVO MESTO (36°N, 47°W) was about 300 mi southeast of the 970-mb center with 72-kn westerly winds. The LASH ATLANTICO (35°N, 56°W) reported waves of 49 ft. By 1200 on the 5th the wave heights had increased. The PASCAL (32°N, 51°W) had 39-ft waves, and the EXPORT BANNER (38°N, 54°W) had 41 ft. Other ships south of the center had 20- to 30-ft swell waves. On the 6th, the C.P. DISCOVERER (51°N, 39°W) had 55-kn northeasterly winds and swells as high as 43 ft. Winds south of the center were generally gale force with 20- to 30-ft waves. On the 7th the storm started to collapse as another moved eastward and an associated center rushed eastward. The MONAGAS arrived Bilbao from Havre with weather damage.

Monster of the Month--As a LOW out of the Midwest approached the Appalachian Mountains, a second LOW formed east of the mountains early on the 5th. Its center crossed the coast at Norfolk and deepened rapidly over the warmer water. There were a few gale reports near the front on the 6th. New York City and areas of New Jersey had 10 in of snow. By 0000 on the 7th the storm was 960 mb near 40°N, 59°W.

The 19,247-ton Israeli MEZADA reported a hold flooded on the 7th while about 96 mi southeast of Bermuda. She later sank. There were 35 persons aboard but only 11 were saved. Winds of 47 kn and waves of 18 to 24 ft were reported. The HELLENIC IDEAL had engine trouble in heavy seas 200 to 300 mi away. The tug POINT CARROLL reported a barge with 5,200 tons of crushed stone broke loose on the 8th near 40°N, 62°W. The ZIM LIVORNO reported storm damage March 6 to 8 from New York to Haifa which was probably from this storm. The CONCORDIA STAR lost containers overboard on the 6th about 500 mi east of Hampton Roads and a hole was punched in a wing tank. The CASTILLO DE ALMANSA was disabled while 1,000 mi east of Philadelphia with a cargo of coal. The 44,881-ton American GOLDEN ENDEAVOR headed for Halifax, Nova Scotia, was in heavy weather on the 9th. The vessel's intended course was 275°, but she had a speed of minus 2 kn in westerly winds of force 13. Her hull was flexing and she could not turn 180° due to high following seas. The CAST DOLPHIN also suffered damage in this storm and diverted to Halifax.

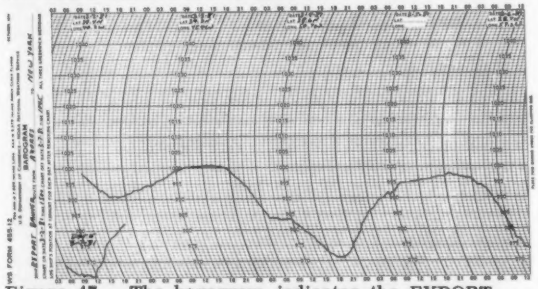


Figure 47.--The barogram indicates the EXPORT BANNER had passed through two storms in less than 3 days. This one on the 7th was the worst.

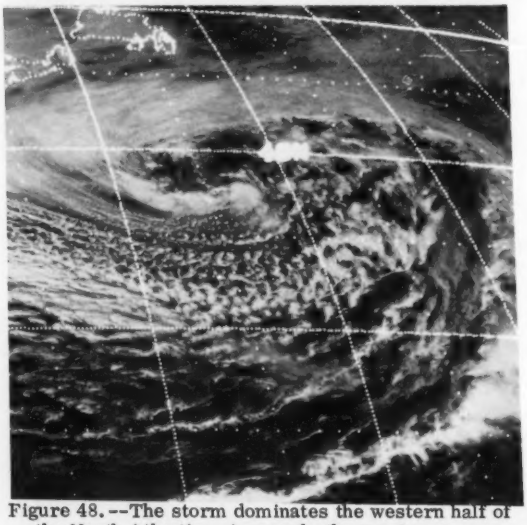


Figure 48.--The storm dominates the western half of the North Atlantic. As usual, the most severe weather was in the southwest quadrant as indicated by the unstable clouds.

The EXPORT BANNER was near the center of the storm with a 966-mb pressure, 45-kn winds, and 26-ft swell waves (fig. 47). At 1200 on the 7th the LASH ATLANTICO (36°N, 56°W) had 50-kn winds and 49-ft waves about 200 mi south of the center. At 1800 the seas had dropped to 36 ft, but the swells had increased to 52 ft. There were winds near 50 kn in all but the eastern quadrant (fig. 48). The winds were still blowing over 50 kn on the 8th with the LANTAU TRADER, 250 mi northwest of the 964-mb center, finding 52-kn northerly winds with 46-ft waves. On the 9th the LASH ATLANTICO now near 39°N, 50°W, had 41-ft waves. The winds were now decreasing in intensity, but high waves over 20 ft continued. On the 10th the DOCTOR LYKES and WERA JACOB both near 45°N, 36°W, had winds above 60 kn with 25-ft waves. The JEFF DAVIS (46°N, 42°W) had 33-ft swells. The FORT NORMAL and WERA JACOB, both southwest of the LOW, had swell waves of 49 ft and 43 ft, respectively, on the 12th. The storm moved over Ireland on the 13th and was no longer of concern.

A trough moved off the U.S. East Coast on the 12th. By 1800 a LOW had formed in the trough about 450 mi east of Cape Cod. By 1200 on the 13th a Soviet ship near 35°N, 52°W, was reporting 47-kn winds and 26-ft waves southwest of the 986-mb center near 41°N, 49°W. The IRISH PINE was 450 mi east of the center with 33-ft swell waves. On the 14th the GERTRUD JACOB (40°N, 50°W) was being pounded by 60-kn winds driving 25-ft seas and 33-ft swells. At 1300 the 41,108-ton Greek tanker HALKI radioed she was near 38°N, 39°W, in force 10 to 11 westerly winds and waves over 20 ft with damage on the deck. At 1800 the ARCTIC TROLL found 52 kn and 33-ft swells in the southeast quadrant. On the 15th the IRISH PINE was on the southwest edge of the storm with 60-kn winds, 20-ft seas, and the code indicated giant 66-ft swells on her stern. Farther along the wind trajectory and fetch the ARCTIC TROLL still had 33-ft swell waves. Later in the day another storm over Nova Scotia sapped this storm's strength, and it abruptly disappeared.

A LOW that moved north of the Great Lakes started breaking down and on the 14th a new center was found south of Cape Cod. The circulation developed rapidly over the new source of energy, and gales were blowing by the 15th. At 1200 the WERA JACOB (39°N, 57°W) had 55-kn winds with 33-ft seas and 46-ft swells. The 970-mb storm was over Nova Scotia. The DAWSON (42°N, 62°W) had 65-kn winds at 1800 with 30-ft waves with only a slight decrease. On the 16th the WERA JACOB south of the 977-mb storm center again had 55-kn winds, 33-ft seas, and 46-ft swells. A ship at 35°N had 30-ft swells. By the 17th this storm was gone.

This weak low-pressure center started over northern California and raced across the southern part of the United States at about 30 kn. At 1200 on the 16th it was 994 mb over western Virginia. Twelve hours later it was 972 mb south of Cape Cod and in another 12 hr was 960 mb near Cape Sable. At 0000 on the 17th the GYPSUM KING off Cape Hatteras found 60-kn winds. At 1200 the FORT NORMAN (33°N, 59°W) had 60-kn winds and 33-ft waves. The AMERICAN TRADER had 50 kn. There were many ships with winds

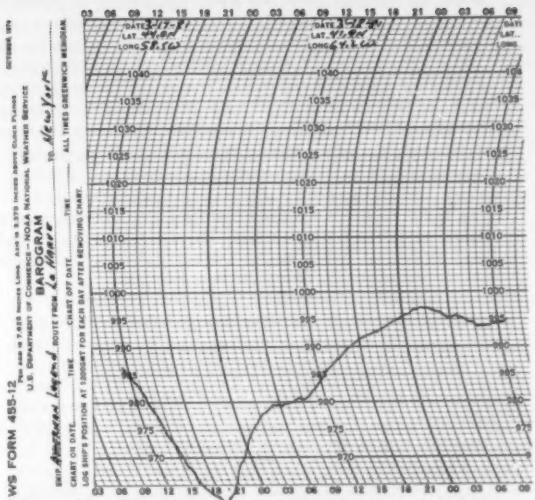

WS FORM 455-12
U.S. DEPARTMENT OF COMMERCE—NOAA NATIONAL WEATHER SERVICE
SHIP American Legend
ALL TIMES GREENWICH MERIDIAN

Figure 49.--The AMERICAN LEGEND passed slightly south of the 959-mb storm about 1900 on the 17th, when the barograph pen went off the chart.

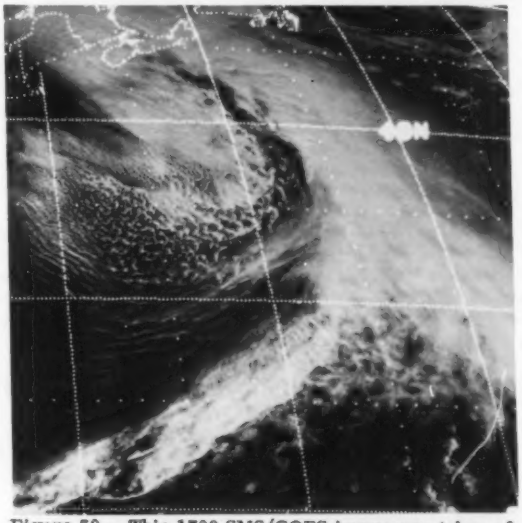


Figure 50.--This 1700 SMS/GOES image was taken of the storm about 2 hr prior to the low point on the barograph of the AMERICAN LEGEND. The center of the storm is over Cape Sable.

stronger than gale force. The WERA JACOB, an ore carrier which appeared to be loitering in the area, again had 60-kn winds, 23-ft seas, and 39-ft swells. The AMERICAN LEGEND was near 43°N, 61°W, at 1800 with 55-kn southeasterly winds, 20-ft waves, and a sea-level pressure of 965 mb. Less than an hour later the pressure dropped to a minimum of 962 mb (figs. 49 and 50). By 0000 on the 18th the winds were 63 kn from the west with 23-ft waves. The storm was now traveling northward over the Maritime Provinces. The high winds and waves reached as far

south as latitude 30°N but were retreating northward by the 19th. This was the result of the transfer of the circulation to a new low center that formed southeast of Cape Race. The ESSO KARACHI with 138,000 barrels of oil aboard broke loose from a tug in heavy seas 50 mi south of Bermuda on the 18th. She had been taken in tow after developing engine trouble. The tug later reconnected. By 1200 on the 19th this new center had taken over. There were several storm wind reports and waves up to 20 ft.

On the 20th yet another center formed farther east which supported some gales, but the swell waves had built as high as 30 ft in the westerly flow. This center moved over the North Sea on the 22d.

The bulkcarrier ARIADNE out of Dunkirk had a cargo of steel pipes shift in heavy weather on the 22d and diverted to the Azores to resecure probably due to this storm. The French container vessel ST. BERNAD, while docking at Le Havre, hit the Russian tanker GURZUF in 60-kn winds. The French tanker LIVORNE PACIFIQUE at Antifer Port had to stop discharging due to the high winds.

A LOW that came across Cape Hatteras and moved northeastward left a weak trough off the coast and a frontal wave formed and filled the void on the 20th. Using the other circulations as a base, this LOW developed into a large storm. It originally moved northeastward then on the 21st turned southeastward. At 0600 the CJR6 had 58-kn northeasterly winds near 44°N, 59°W, with 38-ft waves. At 1200 on the 22d the 980-mb storm was near 41°N, 50°W. An American ship that may have been the DEFIANCE (38°N, 58°W) had 40-ft waves. At 1800 the EL PASO ARZEW (35°N, 51°W) had 52-kn winds and 36-ft waves.

The storm continued eastward with winds up to 50 kn and waves up to 30 ft until turning northward on the 24th. Romeo was tossed by 30-ft seas on the 25th. The AMERICAN LEGACY 200 mi southwest of the 964-mb center had 50-kn winds, as did several other ships, with 33-ft waves. She was under the area of maximum vorticity advection. Icelandic fishing vessels north of the center were reporting 60-kn winds. Ships moving through this same area in the southwest quadrant on the 26th also found winds near 50 kn and waves up to 33 ft.

Another LOW was moving eastward south of this one and sapping its strength. On the 29th the storm was gone.

Casualties--These ships had problems in fog: the SNOW HILL and EUGENIE C. collided south of Port Arthur. The AVELINA ran aground south of Larache, as did the MIQUELON off southeast Sweden. The CARMELITANA MADRE and KONSTANTINOS K. collided 10 mi northeast of Ancona, Italy. The following vessels requested weather damage surveys during March: AVLIS, BOOKER CRUSADE, EASTERN COUNTESS, EL CHAMPION, LA LIMA, and PLATONIC. High winds resulted in the dragging of anchors or other damage to these ships: CUNARD COUNTESS, ENERGY CREATION, GLORY, NOPAL MASCOT, and OGDEN NELSON.

The ELOCEAN stranded near Piraeus in bad weather, and the ADRIA ran aground in the Gulf of Ageba on the 19th. The CITY OF TEMA developed a 30° list when bad weather caused her cargo to shift in Flushing Roads on the 23d. She also ran aground.

The 1,476-ton CURRENT VENTURE arrived Miami from New York on the 27th with weather damage. Two 499-ton West German ships had problems. The last week of the month the WHESTSTAR was missing on a voyage to the Azores. Also, the WHESTTRADE arrived Casablanca with weather damage. The ALEXA arrived La Coruna with weather damage from the 28th. The British MYRMIDON reported weather damage on the 29th on arrival at Havre. The MULTAN returned to Bilbao with weather damage on the 29th. The RIO CALCHAQUI put into Vigo on the 31st with weather damage, and the SUNNY KARINA was at La Goulette Roads after encountering heavy weather.

Other Casualties--The 6,000-ton Pakistani LALAZAR sustained weather damage off the Cape of Good Hope on the 4th to the 6th. The 8,295-ton Dutch AMERSFOORT encountered heavy weather on a voyage from Houston to Durban.

Rough Log, North Pacific Weather

February and March 1981

ROUGH LOG, FEBRUARY 1981--There were the usual or greater number of storms this month and they were well-behaved in that they followed a predictable path. Many formed over or east of Japan, taking an initial easterly path, then turning northeastward. Those from the vicinity of Hokkaido generally favored the Aleutian route, while those off Tokyo were routed in the Gulf of Alaska. Those that formed over midocean generally took the same route. A few storms formed off Washington State and moved onto the coast. All this generally was in good agreement with climatology.

The monthly mean pressure pattern was also in good agreement with climatology. The 993-mb Aleutian Low was 6 mb lower than normal near 48°N, 177°E, slightly southwest of its mean location. The Pacific High at 1021 mb was near its usual position.

The largest and most significant anomaly center was minus 9 mb centered near 44°N, 180°. Most of the ocean was negative, except near both coasts. There was a plus 3-mb center off Vancouver Island, which can be detected in the storm tracks.

In the upper air pattern the primary low center was near 50°N, 177°E, well east of its usual position. This affected the sharpness of the trough over the central ocean.

Extratropical Cyclones--A LOW with frontogenesis was found on the 1200 chart of the 3d just east of Tokyo. The storm was moving eastward. There were a few near gales, but at 1800 the Japanese ship JMLP found 58-kn southeasterly winds with 25-ft waves near

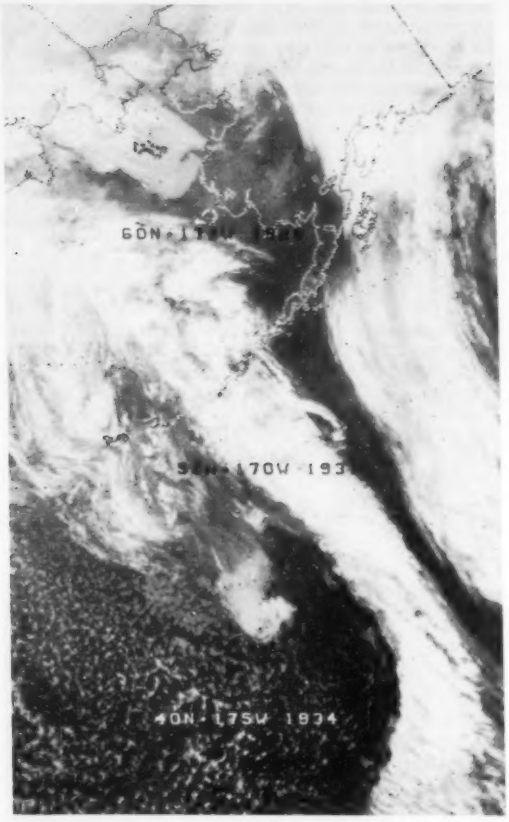


Figure 51.--The storm is centered over the Andreanof Islands at this time.

39°N, 163°E. On the 5th there were several reports in the 45-kn range with one swell observation of 26 ft. On the 6th this storm invaded the southern part of the circulation of an older cyclone. Early in the day there were some strong gales and waves up to 25 ft 300 to 600 mi southwest of the LOW. The ALASKA COAST, JUDI B., and GALAXY, in the vicinity of the Aleutians, had 50- to 60-kn winds with gusts to 90 kn and waves to 18 ft. By the 7th this storm had absorbed the other center (fig. 51). The winds were light with 40 kn the maximum. The center was 972 mb north of Tanaga Island and on a northwest track. The storm dissipated on the 8th on the Siberian coast.

This storm formed south of Honshu on the 7th. On the 8th the OGDEN CONGO (37°N, 155°E) had 50-kn winds from the northwest. The VERVALUE (33°N, 149°E) had 33-ft swell waves. By 0000 on the 9th the storm was 958 mb near 47°N, 168°E, and on a northerly track. This took the same type of track as the first one. There were many reports over 50 kn, including the PIKE-BANK (45°N, 169°E) with 56-kn winds, 33-ft seas, and 46-ft swells. The WISTERIA (51°N, 167°E) reported 60 kn with 26-ft waves. At 1200 the NEW GOLDEN PHOENIX (48°N, 172°E) was east of the center with 76-kn winds and 23-ft waves. There were still some 50-kn winds early on the 10th, but later in the day the center was over Kamchatka and headed for oblivion. Far to the south that day the VERVALUE (38°N, 167°E) found 40-ft swell waves.

On the 5th the Pacific High was off Seattle and there was a large area of very weak pressure gradient between it and Hawaii. On the 0000 chart of the 6th an observation from a SHIP indicated a weak LOW had formed. An old weak front moved into its circulation. It was associated with a weak cut-off LOW imbedded in a sharp southeasterly oriented upper air trough. On the 9th it was found that both the upper and sea-level LOWs had intensified. The tighter gradient was north through southwest of the center. A Japanese ship found 48-kn northerly winds with 23-ft waves. The GOLDEN FOREVER to the south near 32°N, 160°W, was involved with 30-ft swells. The AUSTRAL RAINBOW (32°N, 157°W) had 45-kn winds and 25-ft waves on the 9th. The FORTUNSTAR had 54-kn winds northwest of the 978-mb LOW. A ship closer to the center had 28-ft waves, and one south of the center had 26-ft swell waves.

The storm was traveling northward and weakening. On the 12th there were two other LOWs southwest and southeast of this one, which died out on the 13th.

The La Perouse Strait produced this storm. By 0000 on the 12th the PACLADY (37°N, 157°E) found 52-kn winds. Other ships found gales and 20- to 25-ft waves. The storm was 976-mb by 1200 on the 13th near 40°N, 175°W. The TOYOTA MARU No. 16, SANTA BARBARA MARU, and AMELIA TOPIC had 45- to 55-kn winds and 30- to 43-ft waves in the area between 30° and 35°N and 170° to 175°E. The area expanded southward and eastward on the 14th.

The storm was traveling northeastward toward the Gulf of Alaska and the gradient was weakening. The only report of winds as high as 50 kn was from the GOLDEN SABRE as a trough passed. The wind waves were 28 ft and the swell waves 36 ft. On the 16th another LOW was moving into the southwest sector from the northwest and yet another was moving into the eastern sector from the southwest. After 1200 the original LOW faded.

Monster of the Month--On the 16th there was a large, flat low-pressure area south of the eastern Aleutians. There were three weak LOWs just south of the islands and another moving around the southeastern periphery. The northeasterly winds through the islands were not

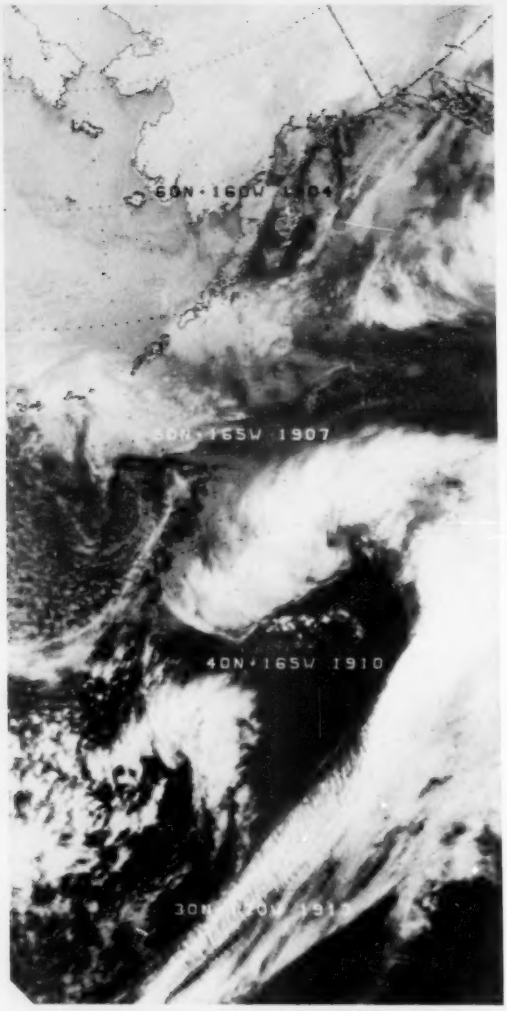


Figure 52.--There are three weak surface LOWs about 200 mi south of the Aleutian Islands that are not readily apparent on this image (49°N, 172°W; 52°N, 157°W; 58°N, 142°W). They could be positively analyzed only with ship and island observations. The northeasterly flow brought extremely cold air from Alaska and off the sea ice.

especially high, but the air temperature was very cold, resulting in a lot of freezing spray (fig. 52). On the morning of the 17th the STORM PETROL, east of Unimak Island, reported heavy freezing spray during the night with all hands chipping. The JUSTINE FOSS nearby reported 35- to 45-kn winds, 8-ft seas, 22°F air and 39°F sea temperatures with moderate freezing spray and 3 in of ice on the superstructure. The morning of the 18th the NOAA ship MILLER FREEMAN reported snow with visibility as low as 1/4 mi, 25- to 30-kn winds, 10-ft waves, and moderate freezing spray north of Unalaska Island. At the same time the JUSTINE FOSS, now east of the Shumagen Islands had 6 in of ice on the superstructure. Their afternoon report did not mention ice. These reports were all received by WBH-29 Kodiak.

The warmer waters east of Kyushu produced the embryo of this storm on the 20th. On the 22d it was producing winds over 50 kn as attested to by the BELLMAN with 50-kn winds and waves up to 23 ft. At 0000 on the 23d the LOW was 960 mb near 47°N, 170°E (fig. 53). The MOSEL EXPRESS (38°N, 156°E) had 63-kn northwesterly winds with 39-ft seas and the Japanese JLHD (39°N, 166°E) had 60 kn with swell waves of 49 ft. There were many reports of winds over 45 kn and waves over 25 ft. The AMERICAN AQUARIUS (37°N, 171°E) had 55-kn winds and 44-ft seas at 0600. The storm reached its lowest pressure of 956 mb at 1200. There were fewer observations by radio at that time and also on the 24th. Hopefully, the fewer radio reports of high winds meant ships were rerouting to avoid the more severe weather as the storm was still very powerful.

The storm center crossed into the Bering Sea near 180° on the 25th. It was shrinking in size and weakening. The PRESIDENT TAFT was south of Kodiak

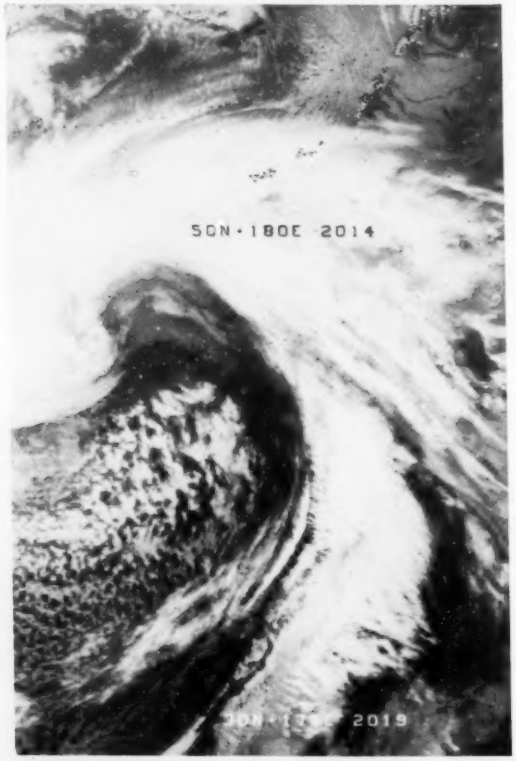


Figure 53.--The large high-cloud shield indicates the depth of this storm and thus its strength.

Island with 45-kn winds and 25-ft waves. The storm ended over Bristol Bay on the 26th.

This potential storm came out of the Sea of Japan on the 24th and raced eastward under zonal flow. At 0000 on the 26th the YOUNG SCOPE (40°N, 158°E) experienced 50-kn winds with 23-ft seas as the LOW raced north of them. By 1200 on the 27th the LOW was 966 mb north of Adak Island. On the 28th the DAWN at Hannah Rocks and the RUFF AND REDDY at Raspberry Strait had 50- to 60-kn winds. On March 1 the KOFU-KU MARU near the Rat Islands had 55-kn winds with 26-ft waves. The JAPAN APOLLO found 48-kn southwesterly winds with 30-ft swells north of Adak Island on the 2d. The storm disappeared over the cold sea on the 3d.

Casualties--The GALLEON TOPAZ with a crew of 26 sent a distress signal because of stormy seas on the 3d while 1,615 mi south of Tokyo. She was feared sunk, but the Coast Guard in Honolulu found her later. The SEA TIGER requested a heavy weather damage survey on arrival in Japan. The AQUACHARM requested a weather damage survey on arrival in Japan on the 3d. The ALEGRIA DE PIO was due Tokyo on the 5th with heavy weather damage. The barge ALSEA, towed upside down to Honolulu dragged anchor in strong winds and grounded on the 10th.

The following ships requested heavy weather damage surveys for damage in February: SPECIALIST, AUSTRALIAN PROGRESS, CARA, AMELIA TOPIC, AEGIS FAME, JALAVIJAYA, and SEQUOIA.

The ZUIYO MARU capsized in rough seas in the Sea of Japan on the 17th. All eight crewmembers were missing. The PAPAGAYO UNIVERSAL drydocked in Vancouver for alleged weather damage between the 21st and 25th enroute to Seattle. The IZUMO MARU discharged weather damaged cargo at Guatemala on the 27th.

The ASTERION (16,112 tons) and JHELUM (5,922 tons) collided at Kagoshima when the latter dragged anchors. The KOMSOMOLETS NAKHADKI (4,054 tons) sank in stormy seas in Tsugaru Strait on the 26th. The MARSHAL ROKOSSOVSKIY picked up 18 crewmembers, but 15 were already dead, with 20 missing.

ROUGH LOG, MARCH 1981--The number of storms appeared to be near normal, but the average storm was deeper than normal as indicated by the mean pressure. One primary storm path stretched northeastward from near Tokyo to near Umnak Island. Another was northward to the Alaska Peninsula from the vicinity of 45°N, 165°W. There was a secondary track from the Kurile Islands into the central Bering Sea and another from off Vancouver Island northward toward Yakatat. These approximated climatology, especially the first primary track.

Climatology shows two centers for the Aleutian Low: the primary one near 50°N, 170°E, and the other over the Gulf of Alaska. This month's mean center was 989 mb near 53°N, 171°W, about half way between the two climatic centers. The Pacific High had two 1023-mb centers along 30°N at 160°W and 138°W and stretched farther west than normal.

There was one large minus 19-mb anomaly center near 53°N, 166°W. The zero isoline approximately paralleled latitude 35°N from California to 170°E, where it turned northwestward into the Sea of Okhotsk.

The 700-mb low center was over the central Bering Sea rather than the Sea of Okhotsk. The pressure surface heights were basically below normal north of latitude 35°N and higher south of that latitude. The normal ridge over the Rocky Mountains was more pronounced than normal with positive anomalies along that coast.

Typhoon Freda developed among the Marshall Islands.

Extratropical Cyclones--This storm was first traceable south of Honshu on the 3d. The NEW GOLDEN PHOENIX (31°N, 153°E) was east of the front sailing westward with 58-kn southwesterly winds on the 5th. A ship near 39°N, 152°E, which the LOW had passed over at about 2000 on the 4th, had 30-ft swell waves.

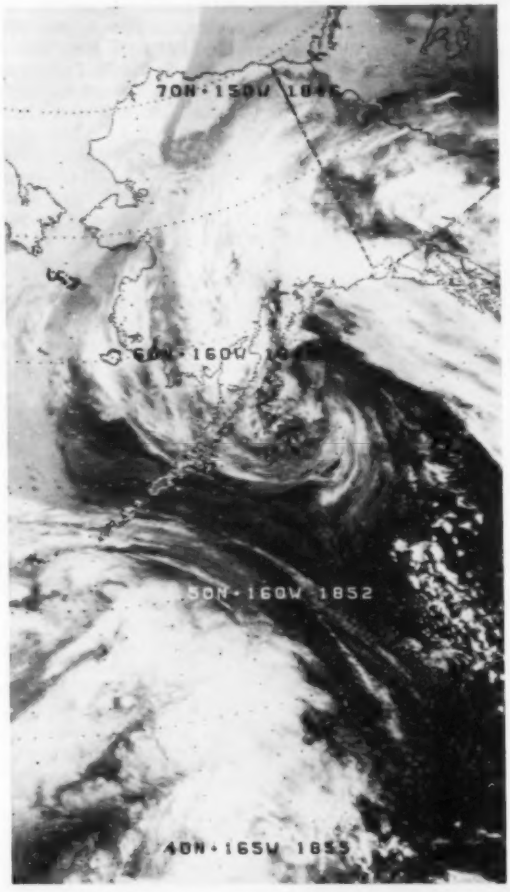


Figure 54.--The storm is centered near Kodiak Island at 1850 on the 11th. There are strong winds under the clouds off the coast of Alaska.

By 1200 on the 5th the storm was 976 mb near 44°N, 165°E. On the 6th the LIONS GATE BRIDGE was in the southwest quadrant of the storm with 68-kn winds, 20-ft seas, and 31-ft swells. Other ships registered strong gales and waves of 20 to 26 ft. By 0000 on the 7th the LOW was 960 mb. The Chinese BLHW was 750 mi to the south with 23-ft seas and 33-ft swells. The SOHIO INTREPID (52°N, 149°W) had 54-kn winds on the 8th. Other ships were reporting 20- to 25-ft waves. A ship near 45°N, 159°W, reported 39-ft swells. There were a few gale reports and waves near 20 ft on the 9th and 10th, but they were associated more with frontal waves moving around the periphery of the storm than with the storm itself. The low center dissipated on the 10th.

This storm came out of the Amur River Valley of eastern Asia. On the 8th it was 998 mb east of Hokkaido. Several ships off the coast of Japan had gale-force winds. The storm was racing eastward at about 40 kn. There were isolated reports of winds up to 45 kn and waves to 20 ft south and west of the center on the 9th. The storm turned northeastward on the 10th and was one of those that circled the previous storm. On the 11th the 977-mb storm was in the Gulf of Alaska. The pressure gradient between the front and the coast was tightening. The PHILADELPHIA and ARCO FAIRBANKS were near each other in the vicinity of 57°N, 143°W, with 50- and 55-kn winds and the former had 29-ft waves (fig. 54). Ships to the south and southwest reported gales and over 20-ft waves. Buoy 46004 measured 21-ft waves. This LOW disappeared on the 12th as another deep storm approached.

A frontal wave moved over the Yellow Sea from the mainland and quickly developed over the warmer water. It traveled east-northeastward under upper air zonal flow and was 990 mb near 40°N, 155°E, at 0000 on the 10th. There were several 50-kn wind and 20-ft wave reports. By the 12th the storm was 964 mb near 50°N, 175°W. It was a large storm, but the winds and waves were still relatively light. On the 13th the pressure had reached 956 mb, and the center was essentially stationary near 53°N, 163°W (fig. 55). Its circulation

Figure 55.--The storm center is south of Unimak Island. This image covers the central ocean but does not include all of the storm.

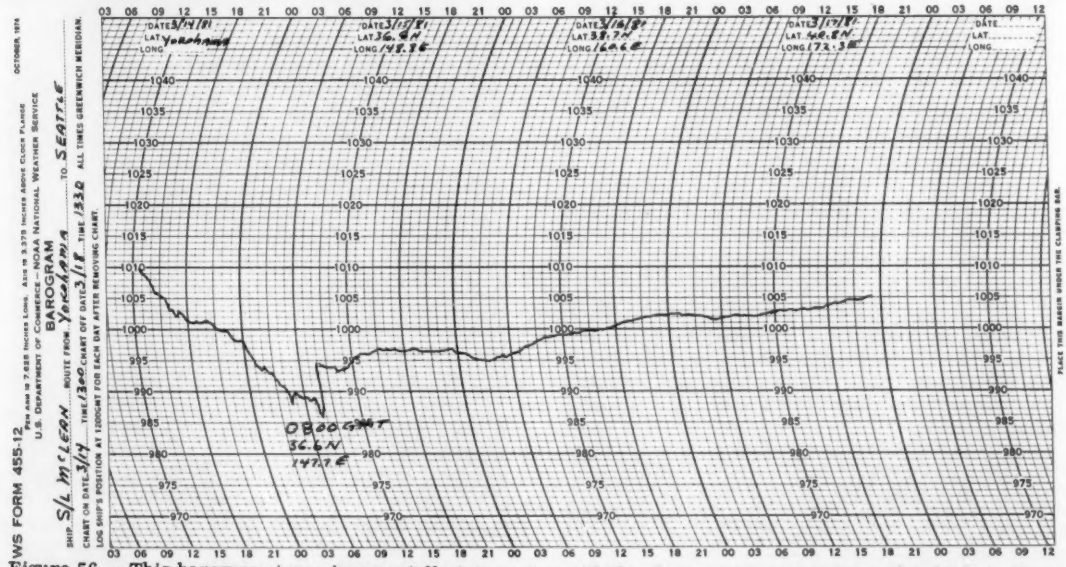

WS FORM 455-12
OCTOBER 1974
U.S. DEPARTMENT OF COMMERCE—NOAA NATIONAL WEATHER SERVICE
BAROGRAM
SHIP S/L MCLEAN ROUTE FROM Yokohama TO SEATTLE
CHART ON DATE 3/14 TIME 1300 CHART OFF DATE 3/18 TIME 1330 ALL TIMES GREENWICH MERIDIAN
LOG SHIP'S POSITION AT 1200GMT FOR EACH DAY AFTER REMOVING CHART
PLACE THIS MARGIN UNDER THE CLAMPING BAR
DATE 3/14/81 LAT Yokohama LONG
DATE 3/15/81 LAT 36.4N LONG 148.2E
DATE 3/16/81 LAT 38.7N LONG 166E
DATE 3/17/81 LAT 40.8N LONG 172.3E
DATE LAT LONG
OBS 0300GMT 36.6N 147.7E
03 06 09 12 15 18 21 00
1040 1035 1030 1025 1020 1015 1010 1005 1000 995 990 985 980 975 970

Figure 56.--This barogram trace is especially interesting with the sharp pressure increase of 8.5 mb in about a half hour.

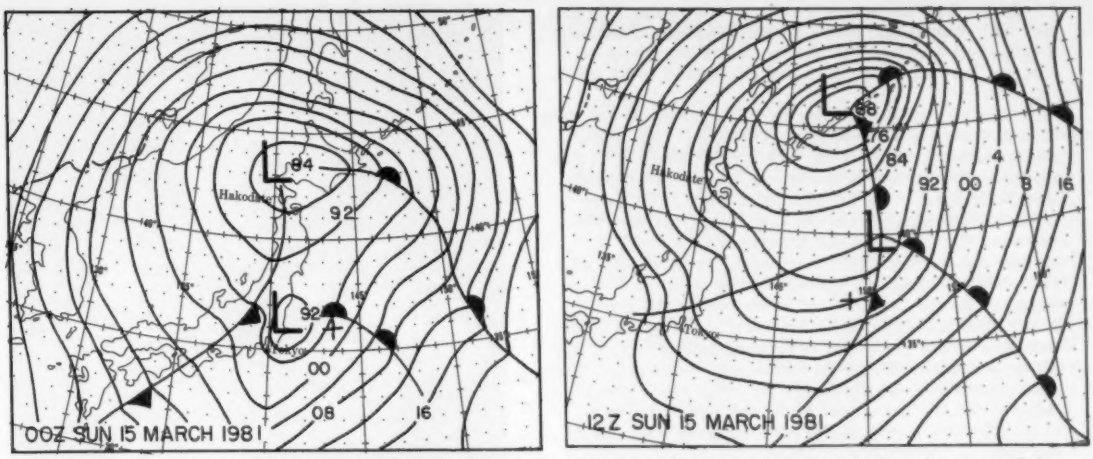


Figure 57.--These two analyses for 0000 and 1200 on the 15th show the storm before and after the jump of the barograph. The MCLEAN probably passed nearly directly through the small LOW.

reached from Kamchatka to British Columbia. Most winds were gales with waves near 20 ft. The highest wind on the radio broadcast was 48 kn in the Gulf of Alaska. On the 14th there were two reports of 50 kn with the highest waves 23 ft. Another LOW was racing into the southwestern quadrant. Late on the 14th a SHIP (42°N, 175°W) found 60-kn winds and 26-ft swells. This LOW disappeared on the 15th over Bristol Bay, but other centers kept the cyclonic circulation alive. By this time the major problem was waves over 20 ft in the northwesterly flow. This last storm had broken down by the 17th.

Another oriental storm. This one traveled over Korea and blossomed to 992 mb over the Sea of Japan. The CHAMPAGNE was east of Hokkaido at 1800 on the 14th with 45-kn southeasterly winds and 25-ft seas. A frontal wave that formed over Honshu reinforced the storm on the 15th. The SEA-LAND MCLEAN was at 36.6°N, 147.7°E, sailing eastward at 0800 on the 15th. The center of the frontal wave must have passed directly over the MCLEAN as indicated by the pressure jump on the barogram (fig. 56). The pressure rose 8.5 mb in about a half hour. At 0600 she logged southerly 40-kn winds with 18-ft seas. At 1200 the winds were 30 kn from the west with 13-ft seas. The analyses made at the time indicated the LOW passed farther north and not as deep as the barograph on the MCLEAN indicated (fig. 57). Information from the HIKAWA MARU indicated that a Russian container ship had container loss and suffered other damage in this same area. Also the ONOMICHI MARU with a cargo of ore sank. At 0000 on the 16th the storm was already 956 mb over the Kurile Islands (fig. 58). Soviet and Japanese fishing vessels among the Islands found 45- to 55-kn winds with waves up to 25 ft. On the 17th the SPRAY CAP (38°N, 178°E) was in the warm sector just east of the cold front with 70-kn southerly winds and waves of 31 ft. The SANKOSUN (47°N, 163°E) had winds of 50 kn and 34-ft swell waves. At 0600 the BLUE BELL (49°N, 166°E) registered 967 mb about 180 mi south of the center with 36-ft seas and 49-ft swells. The PAC MERCHANT (43°N, 156°E) was sailing into 55-kn westerly winds with 30-ft waves.

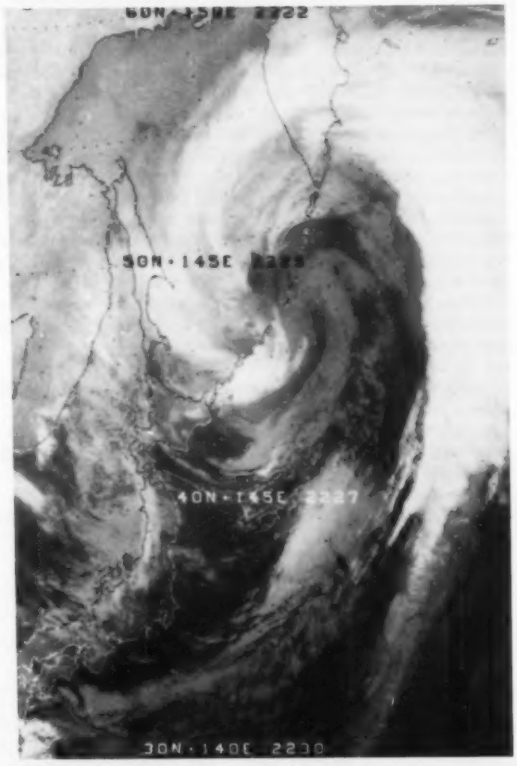


Figure 58.--This image at 2225 on the 15th does not indicate the small LOW and neither did the analysis for 0000 on the 16th.

By the 18th the storm was over the western Bering Sea and weakening. Ships north of latitude 45°N still found 20-ft waves. The storm stalled northeast of Ostrov Beringa on the 19th and dissipated 48 hr later.

This storm was born in the East China Sea on the 20th. It took the usual east-northeast trail but was of little consequence until the 24th. The PRESIDENT TYLER, on the western edge of the storm, found 45-kn winds and 20-ft seas. The CORAL ACE (38°N, 169°E) reported 58-kn winds. On the 25th the storm was 960 mb near 47°N, 180°. The American WGKF (42°N, 177°E) was sailing with 55-kn westerly winds and 25-ft waves pounding her stern. Waves up to 26 ft were reported as far as 1,000 mi southwest of the center. A Panamanian ship, which apparently had some of the numbers in her pressure reversed, was very near the storm's center with 50-kn winds and 26-ft waves. This also appeared to be the case 6 hr later since everything fit when two numbers in the pressure were changed. The storm began its weakening process on the 27th.

Tropical Cyclones, Western Pacific--Typhoon Freda, the first tropical cyclone of the season, developed among the Marshall Islands on the 12th. Reaching tropical-storm strength the same day, she headed west-northwestward. A strong upper level southeasterly flow temporarily restrained her vertical development and hence her intensification. By the 14th Freda started to recurve after passing just west of Eniwetok Atoll. The following day she intensified rapidly as winds climbed to 85 kn and finally 105 kn with gusts to 130 kn; gales extended out 200 mi in the northern semicircle and 100 mi elsewhere (fig. 59). Freda was now heading northeastward for Wake Island. However, beyond Wake was cooler water and a strong band of mid to upper level westerlies that was to spell her doom. She weakened slightly as she passed within 60 mi west of Wake early on the 16th; winds near her 945-mb center were estimated at 100 kn. As Freda crossed the 20th parallel, she continued to weaken and turn extratropical. By the 17th she was down to tropical-storm strength and turning eastward.

Casualties--The 10,625-ton GLADIOLUS encountered heavy weather near Unimak Pass. Stanchions were damaged, chains broken, and bulwark cracked. The vessel proceeded to Kodiak for repairs and restowing. The fishing vessel PACIFIC ANGEL grounded on the 6th in bad weather about 100 mi southwest of Kodiak. The DAITO MARU No. 55 sank about 380 mi northwest of Adak on the 13th in rough seas with hull icing. All 26 crewmen were lost even though one ship was within 2 mi and some 30 ships converged on the area to help search.

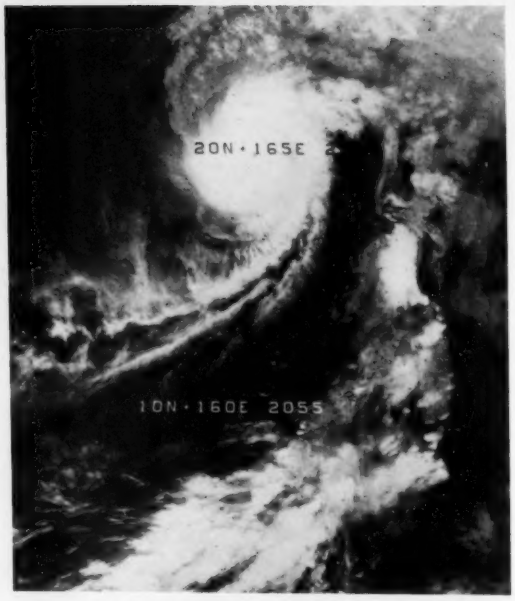


Figure 59.--Typhoon Freda at 2052 on the 15th.

A hydrofoil went aground on the 19th between Hong Kong and Macao in a heavy thunderstorm. Eighty-five of the 170 passengers were taken to hospitals, but only 25 required treatment. On the 23d the NIHON ALPHA was anchored off Midway Island with storm damage.

The following vessels were either in or due Japan with weather damage: AMSTELMOLEN, CLASSIC, MARCONA TRADER, and the DAISY.

Other Casualties--The fishing vessel LIEN HO No. 1 struck a reef near 11°S, 166°W, in bad weather on the 2d. The crew got safely ashore. Three barges were surveyed at Kandla, India, for damage in heavy weather and subsequent stranding while in tow of the tug KESARIT.

WE OF NOAA ARE MAKING USE OF THIS SMALL AMOUNT OF SPACE TO EXTEND OUR THANKS TO ALL THE SHIPS' OFFICERS WHO ROUTINELY TAKE SHIPBOARD WEATHER OBSERVATIONS. TO US, THESE EXCELLENT OBSERVATIONS ARE PRICELESS. WE CERTAINLY DO APPRECIATE RECEIVING THEM REGULARLY.

Marine Weather Diary

NORTH ATLANTIC, JUNE

WEATHER over the North Atlantic is usually very pleasant in June. The number of active extratropical LOWs continues to decline, and storms are usually confined to the higher latitudes--centers north of 45°N over the western ocean and 55°N over the eastern ocean. The building Azores High averages near 1024 mb for the month and is centered over midocean near 33°N, 38°W. The Icelandic Low, oriented east-west, is quite diffuse with the lowest average pressure about 1010 mb, just off the coast of Labrador, near 58°N.

WINDS are controlled largely by the Azores High, with the transient LOWs causing the daily variations. Between 25° and 55°N, southwesterly winds predominate, except over the eastern ocean from the Bay of Biscay southeastward, where northerly winds prevail. South of 25° to about 5°N, the "northeast trades" are generally steady. North of 55°N, winds are mostly variable. On the Mediterranean, east to southeast winds are common over the western half, while northwest winds blow steadily over the eastern portion. Northerly winds are predominant off the Iberian Peninsula and northwest coast of Africa. Northwesterly winds prevail over the eastern Gulf of Mexico, while southeasterly winds are predominant over the southern North Atlantic between the Equator and 5°N. Windspeeds over most of the North Atlantic during June are force 3 to 4. Lighter force 2 to 3 winds are most common over the Mediterranean Sea, Davis Strait, Gulf of Mexico, Bay of Biscay and waters southwestward, and near the Equator. A band of force 4 to 6 extends northeastward from the vicinity of Bermuda toward Ireland.

GALES over the North Atlantic are infrequent during June. Only in the waters near southern Greenland and over northern portions of the Norwegian Sea does the probability of encountering gales exceed 10 percent.

EXTRATROPICAL CYCLONES are fewer in June than in May and not as intense. Cyclogenesis throughout the summer occurs principally in the area from the Carolinas, west of 65°W, to Hamilton Inlet, Labrador, west of 50°W; north of Scotland; northwest of Iceland; over the waters southwest of the British Isles; and over the Gulfs of Finland, Riga, and Bothnia. The major storm tracks during June extend from the Newfoundland area northeastward to the waters south of Iceland, and then east-northeastward across the Scandinavian Peninsula. Another primary track extends from Iowa across central Lake Michigan to southern Lake Huron and down the St. Lawrence River, where it joins a track that develops off Cape Cod.

TROPICAL CYCLONES. Tropical storms average about one every 2 yr. The preferred area of tropical cyclone formation is over the western Caribbean and the Gulf of Mexico. The 49-yr period, 1931-79, had 27 tropical storms, of which 11 reached hurricane strength.

SEA HEIGHTS of 12 ft or more occur between 5 and 10 percent of the time over a broad area that includes the Labrador Sea, around the southern Greenland coast into Denmark Strait, then south of Iceland to the Faeroe Islands and southward to off Ireland's west coast, then southwestward to about 500 mi off Cape Race, and northwestward to include again the Labrador Sea. Other small areas are located between Norway and the Shetland Islands, off the central Norwegian coast, and in the Gulf of Lions. Frequencies of 10 percent or more occur only over an elliptical area immediately south of Kap Farvel. A flat oval area of swell greater than 12 ft over 10 percent of the time is centered about 55°N, from south of Kap Farvel to Ireland. The oval changes from about 5° to 10° of latitude thick from west to east. An area of over 20 percent occurs about 200 mi off the coast of Colombia.

VISIBILITY. The frequency of fog approaches its maximum over the northern ocean. The Grand Banks is the foggiest region--visibility below 2 mi is reported on more than 30 percent of all observations. The percentage of this low visibility decreases to between 20 and 30 percent of the observations over the Davis Strait and the northern Labrador Sea, and over the waters east of Kap Brewster, Greenland. The latter area is usually ice-covered at this time of year. The fog is generally observed in warm, moist air brought by southerly winds into this area of cold ocean temperatures.

NORTH PACIFIC, JUNE

WEATHER. The summer regime is well established over the North Pacific in June. Vigorous extratropical storms are increasingly less frequent. The Subtropical High is centered near 36°N, 149°W, and has an average central pressure of about 1022 mb. The Aleutian Low, located north of the western Aleutian Islands, fills rapidly during June; by the end of the month, it has disappeared, leaving only a trough.

WINDS north of the trade wind belt are variable over the broad scale, ranging from northwesterly to northerly off the United States and Canadian coasts, to southerly east of Japan, to westerly over the Aleutians. Over the Gulf of Alaska, they are southerly to westerly. Northeast of Hawaii, the winds blow from the northeast. The speeds average force 3 to 4 north of 25°N. South of 25°N (30° east of 145°W) to the Equator, steady "northeast trades" dominate, with force 4 the most common speed. The southwest monsoon is established over the South China Sea. Southeasterlies prevail over the Philippine Sea, switching to southerly south of Japan and Korea.

GALES are rare in June. Only over a small area near 46°N, 145°W, does the chance of encountering gales exceed 5 percent.

EXTRATROPICAL CYCLONES. The most favorable area for cyclogenesis continues to be east of Honshu.

The primary storm tracks lead from here east-northeastward to the Gulf of Alaska. Another track approaches the Gulf of Alaska on a northeasterly course from midocean.

TROPICAL CYCLONES. The probability of tropical storm development continues to rise sharply in June, approaching the late summer and early fall maximum. On the average, three of these storms develop per year--one or two during this month in Asiatic waters, and one or two over the ocean area between 10° and 20°N, and the Mexican west coast and 120°W. About two out of three western North Pacific tropical storms go on to become typhoons. One out of three eastern North Pacific storms reach hurricane intensity.

SEA HEIGHTS of 12 ft or more have a frequency greater than 10 percent only in two small areas. One is centered south of the Alaska Peninsula near 48°N, and the other south of the western Aleutians near 46°N. Generally, sea conditions are improving as summer approaches. Areas of high swell are located in the northern Gulf of Alaska and Bering Sea, south of the ice edge.

VISIBILITY. The frequency of low visibility increases over most of the North Pacific. The waters east of the northern Kuril Islands are particularly foggy, with the visibility dropping below 2 mi in over 40 percent of the observations. From the outer boundaries of this area northward to Kamchatka, southward to the central Kurils, westward to the eastern Sea of Okhotsk, and eastward to 162°E, this percentage drops to 30 to 40 percent of all observations. The area of low visibility, which encompasses 20 to 30 percent of all observations, extends from the southern Sea of Okhotsk through the central Kurils, and then eastward through the North Pacific along the 40th parallel to 165°W. The line bordering the boundary of the area then bends westward to midocean near 47°N, 175°E, before curving northeastward through the central Aleutians to St. Lawrence Island in the Bering Sea.

NORTH ATLANTIC, JULY

WEATHER conditions are relatively settled during July as the Azores High, centered near 35°N, 44°W, builds to a seasonal maximum of about 1025 mb, and primary storm tracks are displaced north of 45°N. The Icelandic Low remains an ill-defined east-west trough with the lowest pressure, about 1009 mb, centered near Hudson Strait in eastern Canada.

WINDS over the middle and northern latitudes have southerly and westerly components. Northerly winds are common near the entrance to the Mediterranean, while over the Sea itself, northwesterly winds are steady. Winds from the northerly quarter are found over the North Sea, off the central Norwegian coast, and over the Davis Strait and the waters southwest of Iceland. The "northeast trades" blow between 10° and 25°N, while in the Gulf of Mexico, easterly winds are most frequent. Near the Equator, southeasterlies dominate the area between South America and Africa. Windspeeds average about force 3 to 4 over most of these areas except over the Mediterranean Sea, the Davis Strait, and the Gulf of Mexico, where force 2 to 3 winds are prevalent. The strongest winds, of which nearly two-fifths of all observations are force 5, are encountered over the waters of the southwestern Caribbean Sea.

GALES. The frequency of gales is at a minimum for the year. Only over the Norwegian Sea is the percentage frequency of gales 10 percent or higher.

EXTRATROPICAL CYCLONES. From June to July, a marked northward shift of cyclonic activity occurs over the North Atlantic. Areas of cyclogenesis are along the North American coast from the Carolinas to north of Newfoundland, in the Denmark Strait, southwest and north of the British Isles, in the Adriatic Sea, and over the Gulfs of Bothnia, Finland, and Riga. The primary cyclone tracks lead from the Hudson Bay region northeastward through the Davis Strait, from the Grand Banks and the Gulf of St. Lawrence toward Iceland, and from north of Scotland eastward across southern Scandinavia. Two secondary tracks cross the Great Lakes. One extends from the Great Plains across eastern Lake Superior toward Labrador, while the other cuts an east-northeasterly swath across Lakes Erie and Ontario, New York, and New England, before merging with the Carolina storm track over the Gulf of St. Lawrence.

TROPICAL CYCLONE activity is still limited. On an average, three storms will occur during a 4-yr period, and half will develop into hurricanes. July tropical cyclones usually originate over the Gulf of Mexico or just east of the Lesser Antilles. Those forming over the Gulf generally move northward across the Gulf Coast, while those born east of the Lesser Antilles may move westward across the Caribbean Sea, or northwestward toward the southeast coast of the United States, where they often recurve to the northeast. Sometimes these storms are bred north and east of the Bahama Islands during July.

SEA HEIGHTS of 12 ft or more are encountered with a frequency of 10 percent or more only in a small area immediately south of southern Greenland.

VISIBILITY. Like June, July is one of the foggiest months of the year over the western North Atlantic. Observations with visibility less than 2 mi average 10 percent or more northward of a line drawn from the waters between Cape Cod and Cape Sable northeastward to near 60°N, 30°W. From there, the 10-percent frequency line runs eastward, south of Iceland, to near the Faeroe Islands, and then southward, cutting across Scotland near the Firth of Forth. The line then extends northward along the Prime Meridian to about 63°N, where it heads northeastward to the coast of Norway. The 20-percent frequency line is a little less erratic. It extends from near Cod Island, Labrador, eastward to near 56°N, 47°W; it then extends southwestward across Newfoundland to the Grand Banks. From there, visibilities less than 2 mi occur 20 percent or more of the time west of a line drawn to the coastal waters of Greenland, near Kap Mosting, and then north of the same line extended to 74°N, 20°E. Enclosed within the area defined by Godthaab (Green-

land), Resolution Island, and Ivigtut (Greenland), observations with visibility less than 2 mi exceed 30 percent.

NORTH PACIFIC, JULY

WEATHER. The steady and rather settled summer weather conditions that commenced in June over the North Pacific become widespread and firmly established during July. The Aleutian Low has disappeared from the pressure chart of normals, and the Subtropical High, with a pressure of 1026 mb, has moved northward to near 38°N, 150°W.

WINDS. Because of the strong development and northward position of the Subtropical High, the "northeast trades" extend over a large portion of the ocean. They prevail over all but Asiatic waters south of 30°N. Over the eastern ocean, they extend northward to about 35°N. The southwest monsoon is well established in Asiatic waters, blowing most steadily over the South China Sea. The westerlies of the middle latitudes, because of the absence of the Aleutian Low, are less steady than during the colder months. Large southerly components are found over the western two-thirds of the ocean at these latitudes, while northerly components are the rule closer to the conterminous United States and are also observed out from the Gulf of Tehuantepec. Easterly winds prevail over the waters of the Gulf of Alaska. Windspeeds over the Pacific average slightly less than force 4.

GALES associated with extratropical cyclones are rare during July over almost all of the North Pacific, but a frequency greater than 5 percent does exist over a 2° square north of the central Aleutians.

EXTRATROPICAL CYCLONES. Cyclogenesis during the summer occurs in Asiatic waters from Taiwan northward to Sakhalin, and northeastward to the Near Islands. The greatest frequency is east of Honshu and Hokkaido. Two other areas are found near 47°N, from 155° to 175°W, and over the Gulf of Alaska. The primary storm tracks lead from Honshu northeastward to the Bering Sea, and from a point near 52°N, 157°W, to the Gulf of Alaska.

TROPICAL CYCLONES. Usually three or four tropical storms occur over the western North Pacific during July. Only one of these will not become a typhoon. These storms originate mostly over the ocean areas east of the Philippines. During their early stages, they generally move west-northwestward; after development, some may continue across the northern Philippine Islands into the South China Sea, while others curve northwestward toward Taiwan, the coast of mainland China, Korea, or Japan. Those reaching higher latitudes generally recurve toward the northeast under the influence of the upper westerlies.

Another area of tropical cyclone activity is over the waters off the west coast of Mexico. Around four tropical storms can be expected in July, with one reaching hurricane force. These storms are usually shorter lived, but can be dangerous to both marine and coastal interests. They normally move west-northwestward out to sea, but sometimes they pass inland over Baja California.

SEA HEIGHTS of 12 ft or more may be expected about 10 percent of the time in two small areas south of the Aleutians, near 48°N, 165°E, and near 49°N, 155°W. Areas of high swells are located in the Gulf of Alaska and Sea of Okhotsk.

VISIBILITY. Compared to other months of the year, the occurrence of low visibility over northern waters is most frequent during July. The visibility drops below 2 mi in over 40 percent of all observations over a circular area bordering the northern Kurils on the west and centered near 48°N, 158°E. The 30-percent frequency line is less circular, running from southwestern Kamchatka across the central Kurils to a point near 43°N, 160°E, and then northeastward to the Rat Islands, before swinging westward to Mys Shipunskiy. The 20-percent frequency line also crosses the central Kurils, but extends farther up the west coast of Kamchatka. This line then continues southeastward from the Kurils reaching south of 40°N, between 160°E and the dateline, before moving east-northeastward to a point near 48°N, 145°W, and then north-northwestward to Afognak Island. The entire Bering Sea is enclosed within this 20-percent frequency line, with the exception of the waters northeast of St. Lawrence Island, and the waters north of a line drawn from Mys Ozernoy to Mys Navarin. The 10-percent frequency line is very similar to the 20-percent one. It stretches from the northern Sea of Okhotsk southward to the southern Kurils; it then continues southeastward to a point near 34°N, 170°E, before shooting east-northeastward to about 40°N, 140°W, and then north-northwestward to the Gulf of Alaska.

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ATLANTIC AREA

Mr. Robert Baskerville
Port Meteorological Officer
National Weather Service, NOAA
30 Rockefeller Plaza
New York, NY 10112
212-399-5569

Mr. Charles Schlott
Port Meteorological Officer
National Weather Service, NOAA
Bldg. 51
Newark Airport
Newark, NJ 07114
201-624-8098

Mr. Earl Brown
Port Meteorological Officer
National Weather Service, NOAA
Norfolk International Airport
Norfolk, VA 23518
804-441-6326

GULF AREA

Mr. David Shawley
Port Meteorological Officer
National Weather Service, NOAA
701 Loyola Avenue
New Orleans, LA 70113
504-589-2669

Mr. Peter Connors
Port Meteorological Officer
National Weather Service, NOAA
1600 Port B'lvd
Miami, FL 33132
305-358-6027

Mr. Julius Soileau
Port Meteorological Officer
National Weather Service, NOAA
Route 6, Box 1048
Alvin, TX 77511
713-228-2527

Port Meteorological Officer
International Airport
Box 1837
Jacksonville, FL 32229
904-757-1370

GREAT LAKES AREA

Mr. William Kennedy
Port Meteorological Officer
National Weather Service, NOAA
Cleveland Hopkins International Airport
Cleveland, OH 44135
216-267-0069

Mr. Fred Day
Port Meteorological Officer
National Weather Service, NOAA
14th and Ryan Streets
Sault Ste. Marie, MI 49783
906-632-8921

PACIFIC AREA

Mr. James Mullick
Port Meteorological Officer
National Weather Service, NOAA
Metro Oakland International Airport
P. O. Box 6249
Oakland, CA 94614
415-273-6257

Mr. Donald Olson
Port Meteorological Officer
National Weather Service, NOAA
Lake Union Building, Room 728
1700 Westlake Avenue North
Seattle, WA 98109
206-442-5447

Mr. Anthony E. Rippo
Port Meteorological Officer
National Weather Service, NOAA
2005 T Custom House
300 South Ferry Street
Terminal Island, CA 90731
213-548-2539

PANAMA CANAL
Mr. Robert Melrose
Port Meteorological Officer
National Weather Service, NOAA
Box 1301
APO Miami 34005
(Local: Ft. Davis, Republic of Panama)
46-7205